

*How To Know*  
**THE MOSSES**



**Pictured-Keys for determining many of the North American Mosses  
and Liverworts, with suggestions and aids for their study.**

by

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President of the Sullivant Moss Society**



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## INTRODUCTION

"All mosses look alike to me," "All grasses look alike to me. "All negroes look alike to me." "All Chinese . . .". That is only because we do not know them well enough. To a Chinese student who has just come to the States, all Americans look alike. On acquaintance we find just as many different appearances and behaviors amongst non-caucasians as amongst caucasians, once our attention is not distracted by the conspicuous differences in color of skin.

The different kinds of mosses are pretty obvious when we have learned where to look for the differences. Nobody would say these plants look alike:

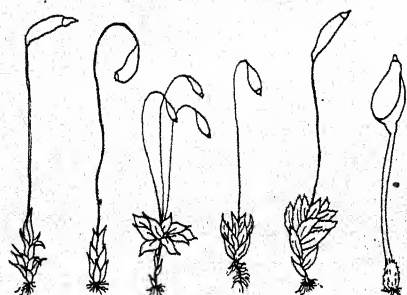
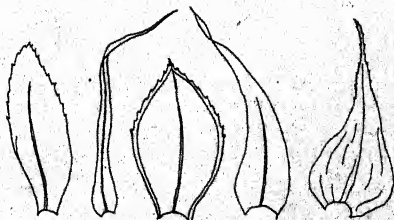


Figure 1. From left to right: *Ceratodon purpureus*, *Funaria hygrometrica*, *Rhodobryum roseum*, *Bryum caespitium*, *Aulacomnium heterostichum*, *Buxbaumia aphylla*.

Or these leaves:

Figure 2. From left to right: *Aulacomnium heterostichum*, *Leptobryum pyriforme*, *Mnium cuspidatum*, *Drepanocladus aduncus*, *Rhytidiadelphus triquetrus*.



Or even these capsules:

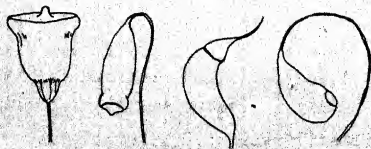


Figure 3. From left to right: *Physcomitrium turbinatum*, *Bryum argenteum*, *Dicranella heteromalla*, *Funaria hygrometrica*.

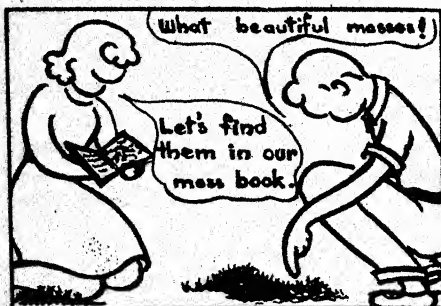
## HOW TO KNOW THE MOSSES

(I have often wondered if our ideas of gnomes and pyxies were drawn from the sober erect mosses, and the curved capsules with their impish pointed caps.) A great many mosses do look alike. Some kinds are so common and abundant that they are seen practically everywhere. We pick up the same identical thing in every continent. A great many of the mosses of North America are found also in Europe.

So there are not too many mosses in any local area for a person to learn to know in a reasonable time. One hundred species in a county is a near average. Chester County, Pennsylvania, has about 150 species. The State of Iowa has about 250 true mosses and 50 liverworts. Several of these have been collected but once. Probably only 150 are found in sufficient quantity to be represented in ten large herbaria; 135 species have recently been distributed to such institutions; thirty species of liverworts have been distributed.

The elegant touch that mosses lend to landscape, covering the naked earth with greenness, is admitted by all of us. On some rich estates mosses are cultivated and cared for because of this artistic value. Each species has its own requirements and its own style of beauty, and its own significance in the order of nature.

We need, now, to know the mosses. And that has become possible, since the completion of Grout's Moss Flora of North America, in which all of



the species of the Continent are described. This little book of ours is an attempt to simplify the identification of mosses. We have culled out the most distinctive recognition characters, and these are shown in pictures adjacent to the verbal descriptions.

It has long been customary for students of mosses to send specimens to specialists to get their identification corroborated or corrected. This is almost necessary for a beginner. Here is how it is done: you collect enough to make two good specimens. A number is assigned to this collection; this same number to appear on the wrapper of each of the two specimens. One specimen is presented to the specialist for keeps; you keep the other. In return for your gift, the specialist sends back word that your No. . . . . is . . . . . The author of these keys will be glad to pose as your specialist. Or, better, join the Sullivant Moss Society and send your specimen to the Curator of Mosses of the Society. You will also receive the *Bryologist*, the quarterly journal of the Society, you will be eligible to publish therein, and you will be helping to support the only surviving moss journal in the world!

## HOW TO KNOW THE MOSSES

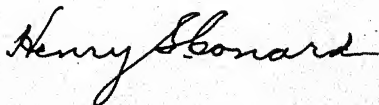
Finally, a Pictured-Key owes its value chiefly to the pictures. This book was made possible by the constant cooperation of my colleague Miss Louisa Sargent, M.A., Assistant Professor of Botany in Grinnell College. She has made all of the pictures, large and small, except a few that are initialed. It is really her book! I am also indebted to two students, Miss Margret Seckel and Miss Virginia Wilson, who worked through many weary hours, and whose drawings are initialed. Each drawing has been approved by the author; if errors are found, the responsibility is his.

In making the pictures we have drawn freely upon all of the sources mentioned herein. In most cases actual specimens from the 10,000 in our herbarium, often several specimens, have been examined, and the drawings have been determined by this actual evidence.

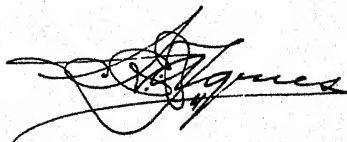
And, of course, I am indebted immeasurably to my good friend the Editor and Publisher, Professor H. E. Jaques, whose advice and assistance all along have been absolutely essential.

If you like the book, tell your friends. If not, tell us.

Grinnell, Iowa  
Sept. 1, 1944

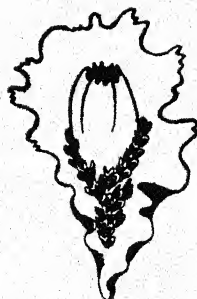


Dr. Conard has been for many years an outstanding teacher and high-ranking scientist. He knows much about many of Nature's creatures. One of his very special fields has been the Mosses. Now Nature lovers everywhere may share with his classroom students his knowledge of these very intriguing little plants. We are sure they will find his book filled with interest and help.



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## ABOUT MOSSES

### WHAT THEY ARE NOT

The gray-green festoons that dangle from trees in the South, the "Spanish Moss", is not a moss. It is a near relative of the pineapple, with the same kind of hairs on the leaves, with flowers, and with silky seeds. No Moss has either flowers or seeds.



Figure 4.  
Spanish moss.

Similar festoons in the Northeast, where " - - - the murmuring pines and the hemlocks" are "bearded with moss", are made of lichens. They bear flat discs containing the spores. Many other leafless gray-green lichens are called mosses, for example "reindeer moss". Of course the moss roses, moss pink, flowering moss and any other "moss" with flowers, is not a moss.



Figure 5.  
Usnea



Figure 6.  
Reindeer lichen,  
Cladonia.



Figure 7.  
Portulaca.



Figure 8.  
Seaweed.

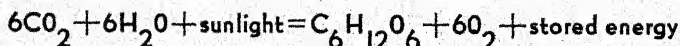
Nor are there any Mosses in sea water. These are algae. Several Mosses grow in fresh water; they have stems with regularly arranged leaves. The Pictured-Key, "Plant Families", explains all of this.

### WHAT THEY ARE

This book attempts to enlarge upon the chapters in "Plant Families" relating to Bryophytes (Atracheata).

1. They are small plants 1/16 inch to 24 inches tall, mostly a few inches. Some are flat, scale-like growths (thallus plants) on earth or rocks or trees. Most of them have stem and leaves, the latter variously but regularly attached to the stem. Run through the pictures in this book to get a general idea.

2. All of the members of this great phylum are photosynthetic. They manufacture their own food out of constituents of earth and air, by means of chlorophyll, with the aid of sunlight. They are green, at least in part.



## HOW TO KNOW THE MOSSES

3. All of them are propagated and disseminated by spores, one-celled particles of living matter with a firm protective wall.

4. At another period in their lives all are propagated by male and female germ cells, which fuse into a single cell (zygote) as in nearly all other plants and in animals. From this single-celled zygote an embryo develops and grows to its own maturity.

### LIFE HISTORY

The whole life of a moss runs this way: a spore, in a favorable spot, swells with water, bursts its shell, and puts forth a slender, branching, many-celled green thread, called protonema. This growth may cover several inches or feet of ground; it looks like a green alga. It is distinguished by having

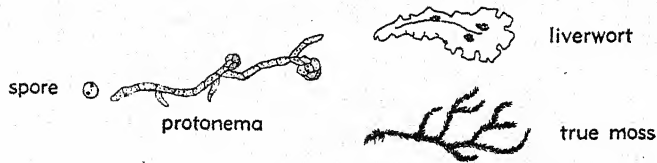


Figure 9.

some of the partitions in the thread oblique, and by having branches going down into the ground, colorless or brown in color. In due time buds (or a bud) appear on this protonema, and each bud grows out as a leafy stem or flattened scale. In either case it is anchored and fed by numerous threads that grow into the soil (rhizoids). Thus we get new moss plants where previously there was none.

When such a plant comes to maturity it produces male and/or female germ cells. The male germ cells are minute colorless coiled bodies, driven by two cilia. They can swim about in a drop of dew or rain for an hour or so. They are produced in oval sacs called antheridia (singular, antheridium)

(Fig. 10). The antheridia are borne in a cluster of leaves, or in a pocket of the scale-like thallus. The egg cell is borne in the bottom of a long-necked vase called an archegonium. When the egg is ready for fertilization, the neck of the archegonium becomes a tube of mucilage, the tip opens, and the mucilage exudes, disseminating cane sugar (or some protein in liverworts). This exudate is overwhelmingly attractive to the spiral sperm. Every sperm coming within the scent of it dashes directly into the neck of

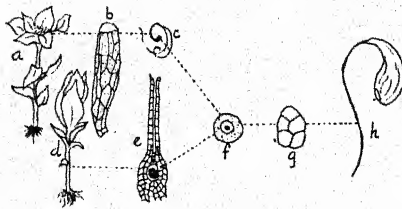


Figure 10. a, male plant; b, antheridium; c, sperm; d, female plant; e, archegonium containing the egg; f, zygote, the union of sperm and egg; g, embryo; h, mature sporophyte of *Funaria*.

## HOW TO KNOW THE MOSSES

the archegonium and swims to the egg. One sperm fuses with the egg, and a new being is initiated.

This new duplex cell remains in the archegonium while it divides into two, then into 4, 8, 16, many cells, and gradually shapes itself into the beginnings of a stalk (seta) and spore-case (capsule). At its maturity, the seta shoots forth, bursting the archegonium and pushing up the capsule into the air, whence the spores are liberated and float away. When the seta of a true moss (*Musci*) bursts the archegonium, the tip of the latter remains as a cover or cap over the tip of the capsule. This cap, the product of the upper end of the archegonium, is called a calyptra. The shapes of calyptras are often very characteristic.

The foot, seta and capsule compose the sporophyte. Being derived from a fertilized egg, the sporophyte is a diploid organism, in which heredity operates as in animals and flowers by pairs of genes. The thallus or leafy moss has only one set of genes; it is haploid. But its hereditary characters are just as precise and dependable as if it had its genes in pairs. This is a curious situation, applicable to all the mosses. Beside this, there are hybrid mosses, and triploids, tetraploids and octoploids. The genetics of mosses is a rich field, as yet only slightly explored.

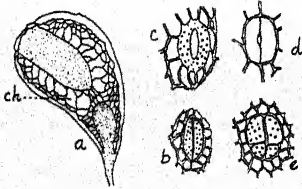


Figure 11. a, section of capsule of *Funaria* showing the netlike chlorophyll tissues; b, young stoma and c, mature stoma of *Funaria*; d, stoma of *Orthotrichum*; e, stoma of *Polytrichum commune*.

The sporophyte (seta and capsule) gets nearly all of its food from the mother plant. Most young sporophytes have a little chlorophyll (leaf-green) by means of which they manufacture a modicum of sugar for food. The capsules of true mosses often have a well developed system of chlorophyll cells and air spaces, served by true stomata, Figure 11.

## WHERE MOSSES GROW

Every state in the Union and Canada has its mosses. Iceland and Greenland have many more species. Mexico and tropical America are very rich in species. The evergreen forests of our west coast, from Santa Cruz to Dutch Harbor, have more and bigger mosses than any other part of the Continent.

Most mosses grow among trees. There is no moss among the grasses of the Tallgrass Prairies or the Shortgrass Plains. Moist spots or bare spots or wooded spots among these Plant Associations have their mosses. Some species prefer exposed rocks in full sunshine. They are found at 14,000 ft. in Colorado, and on boulders or sand beside the seashore. For some we wade waist-deep in ponds, or reach out from boats.

## HOW TO KNOW THE MOSSES

The kinds in each habitat are characteristic, and the assembly of species in each region is characteristic. Give me a list of the mosses of your region, and I will tell you where you live and what other vegetation is native there. Mosses, like other plants, are social organisms. They have their own associations and associates. They indicate the natural conditions of their homes, and give clues to what naturally grows (or grew) there, and what crops can be grown. They even indicate acid or alkaline soils, and what, if any, treatment a soil needs to keep it normal. Unfortunately the indicator value of mosses has been very little studied.

### USES

Perhaps no great group of plants has so few uses, commercial or economic uses, as the mosses. The peat mosses (*Sphagnum*) are used for packing nursery stock. The moss holds moisture in quantity and keeps roots fresh for a journey across the continent. It is gathered from acres of bogs in northern regions, and sold in 50 lb. bales. Clean sprays of *Sphagnum* are sometimes wrapped in cheesecloth, sterilized and used as packing for seeping wounds. *Sphagnum* makes much of the peat, which is the fuel of Ireland and northwestern Europe. But the moss peat of Iowa is mostly *Drepanocladus*. Chopped sphagnum is an excellent cover for a seedbed, or an addition to soil to keep it moist and porous.

The big mosses of the west coast are good for packing crockery. They are soft and springy, and sufficiently long-stemmed and abundant.

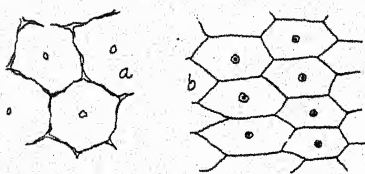


Figure 12. a, section of liver, after Encyclopedia Britannica; b, surface of *Marchantia*, after Kny.

In ancient and medieval medicine mosses had a place. Because the thallus of several scale-like species is marked in polygonal areas, like a cross section of an animal's liver, these mosses were believed to be good medicine for ailments attributed to malfunction of the liver. The plants were therefore called liverworts, a name that is still used for these plants and their kin. No moss is credited with any medicinal virtues according to modern standards.

### CLASSIFICATION

The plants included here under the general term of "Mosses" are of three distinct types, as shown in Fig. 13. They are all so much alike in structures and life-history that the same terms (with few exceptions) apply to all. The whole group has long been known as Bryophyta, a term which for thirty years has been unsatisfactory. They belong to the great phylum of green land-plants, and are best characterized by their lack of the special-



# HOW TO KNOW THE MOSSES

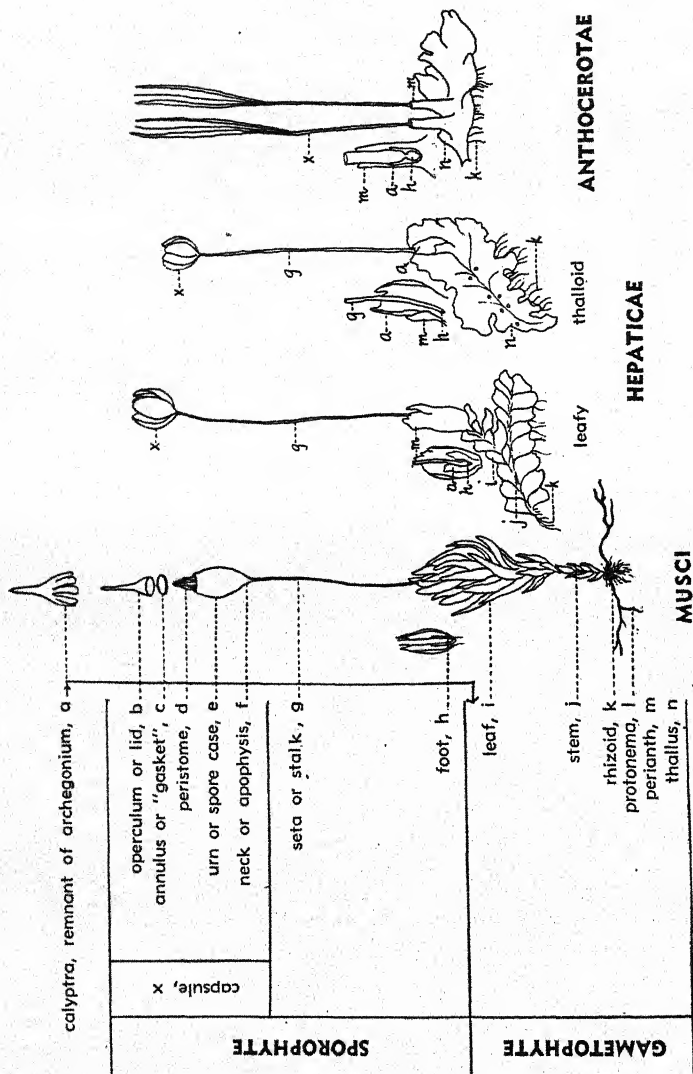


Figure 13. The whole Moss. Left to right: *Ptychomitrium incurvum*, *Lophocolea heterophylla*, *Pellia epiphylla*, *Anthoceros laevis*.

## HOW TO KNOW THE MOSSES

ized water-conducting cells (tracheids and tracheae) which make possible the life of larger land-plants. The "Mosses" are best classed as Atracheata (a, without), overagainst the larger land-plants, the Tracheata.

We divide the Atracheata, then into

Musci or True Mosses,

Hepaticae or Liverworts and

Anthocerotae or Hornworts.

The Anthocerotae includes only one order and one family. The gametophyte is a green thallus or scale, with no distinction of stem and leaf. Fig. 13, Anthoceros laevis.

Hepaticae may be described in four Orders:

1. Jungermanniales, the leafy liverworts. Fig. 13. Lophocolea heterophylla.
2. Metzgeriales, the thalloid liverworts with stalked capsules. Fig. 13. Pellia epiphylla.
3. Sphaerocarpaceae, tiny thallose forms with antheridia and archegonia in sacs.
4. Marchantiales, with spongy (air-filled) thallus, and tiny sporophytes borne on an umbrella-shaped receptacle, or imbedded in the thallus.

The Musci are much more numerous and require a more extensive classification, the outline of which may be shown here:

### Class Musci.

Super-order 1. Sphagnales. Family Sphagnaceae. Figs. 25, 26

Super-order 2. Andreaeales. Family Andreaeaceae. Fig. 24

Super-order 3. Bryales. Figs. 27 to 232

Division 1. Nematodontae. Peristome teeth made of several or many long cells lying lengthways of the tooth.

Division 2. Arthrodontae. Teeth with transverse lines or bars (or lacking), each tooth made of the partition wall between certain cells. (Exceptions in Buxbaumiaceae, Encalyptaceae, Splachnaceae).

1. Haplolepideae. With a single circle of peristome teeth, or various reductions of this. See Fig. 37.
2. Diplolepideae. With an outer circle of hard teeth and an inner membranous set of segments and/or cilia, or various reductions of this plan. See Figs. 17 and 38.

## HOW TO KNOW THE MOSSES

1. *Acrocarpi*: the archegonium and therefore the seta is borne at the tip of an ordinary usually erect leafy stem, with little or no modification of the adjacent leaves. A bud growing out below the "flower" may give the seta the appearance of being lateral.
2. *Pleurocarpi*: Stems always abundantly branching, mostly creeping, with the archegonia and therefore the seta borne in a special lateral bud, with leaves very different from the vegetative leaves (perichaetium).

The rest of the classification, so far as it relates to the plants of this book, will appear in the Systematic List following the Pictured-Keys. It has never been possible to make a useful key to mosses by tracing to families. It is universal practice to key mosses and liverworts directly to the genus. In this key members of one genus may appear in widely separated pages. They are all brought together in the Systematic List.



## HOW TO STUDY MOSSES

To know the mosses go out and hunt for them. About twelve kinds grow on the prairie-campus where I live. Collect all the kinds you can find. If they have no capsules, watch them until they do. But you will soon learn to recognize and identify them by the leaves.

Your equipment will be a carrying sack — any convenient receptacle — with small paper sacks (4 to 8 oz.) or flat pieces of paper. I use newspapers torn to about 5 x 8 or 8 x 10 inches. A hand lens, 10X to 20X, on a shoe-string to hang around your neck. An old knife, 3-inch blade. Bring in everything, and as often as you like. Record the date and place of collecting for every specimen.

The working equipment will be a table, dissecting microscope (preferably binocular), compound microscope (obj. 2/3 and 1/6), fine forceps, 2 fine dissecting needles (one of these may be ground down to a knife blade shape), micro-slides and covers (5/8 in. #2), bottle of water, bottle of dilute glycerine (1/2 water), labels.

Specimens you cannot examine at once are spread out on papers, piled up with blotters between, and weighted with light weights — not over two lbs. When they are dry, they are placed in folders or packets or "pockets." Many collectors adopt a standard size of packet. If it is just as big as the end of a large shoe-box, the whole collection can be stored, card-catalog fashion, in shoe boxes. Some use a large envelope, such that two catalog rows will go into one standard herbarium shelf. I use several sizes, to suit

the specimens, and paste each envelope on a card 5 9/16 x 4 1/4 inches, white for Iowa, manila for North America outside of Iowa, green for Europe (because many of mine are from Ireland), red for the rest of the world. The cards are then stored, catalog fashion, in shoe boxes, or in boxes specially made to fit a herbarium case. Many of us mount the packets by pasting them on standard herbarium sheets, one species to a sheet; finally the sheet is completely covered with packets. These sheets can be placed in genus covers and stored in the usual way. Mosses do

not readily mould, and they are seldom eaten by the insects that so often destroy specimens of flowering plants.

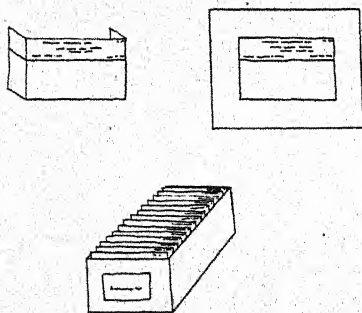


Figure 14.

## HOW TO KNOW THE MOSSES

When we are ready to identify a moss, we select a good shoot with a capsule, pluck it out with the forceps and soak it in water until it is "as good as new" — 5 minutes to 15 hours as required. A moment in boiling water will do the trick.

Lay a leafy shoot of the soaked moss on a glass slide under the dissecting microscope. Hold it firmly near the apex with a needle or forceps, and scrape the stem rather forcibly from apex toward base to remove a lot of leaves. Remove the stem, spread out the leaves, cover and examine with the compound microscope. If papillae are to be sought, a soaked twig may be examined, mounted in water under a coverglass. By looking with low power at the profile of a fold of a leaf, any papillae that are present will appear as tiny projections from the surface of the fold. Very thin sections of the leaf are desirable. And the experienced eye can detect papillae simply by focusing on the flat surface of a leaf.

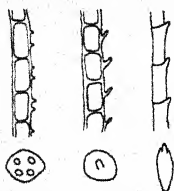


Figure 15.

The capsule may be cut off from the seta and laid on a slide. Carefully pry off the lid, if it has not already fallen. Watch for the annulus, or "gasket," as the lid comes off. Cut off the upper end of the capsule, bearing the peristome. Split this ring-shaped end into 2 or more pieces; lay at least one piece with outer side up, and one with inner side up. Cover and examine. Fig. 16.

When the slide prepared as directed above is examined, you are likely to find that the peristome is obscured by a blur of air bubbles and spores. This condition can be avoided by boiling the capsule under water before dissecting. My practice is to use water at room temperature as directed. Then if the mount is obscured, I hold the slide one or two inches above a lighted match (or alcohol lamp or candle) until the water under the coverglass boils. Then examine and the air bubbles are gone and the spores dispersed. The boiling must be just momentary, and very gentle. Even so the desired pieces of peristome may float out from under the coverglass. If they do they must be coralled and covered again. Only glass covers will do for this; plastic covers crumple.

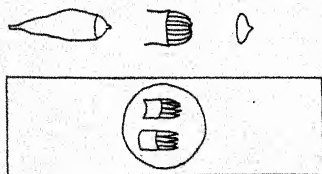


Figure 16.

As the water dries away from under the cover glass, replace it with dilute glycerine—a droplet placed at the edge of the cover. Such a glycerine mount will last forever! It may be labeled and stored.

## HOW TO KNOW THE MOSSES

### WHAT TO LOOK FOR

THE LEAF. Is it broad



or narrow



or filiform



?

Is the margin entire



or toothed



plane



or rolled

upward



or rolled backward (revolute)



or reflexed



?

Has it a single midrib (costa)



or double



or none? Does the

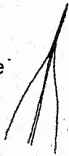
midrib stop at the middle of the leaf, or near the tip, or does it extend clear

to the tip (percurrent)



or does it extend beyond the leaf as an awn

or bristle



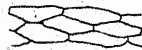
? Are the cells isodiametric



or elongate



or long-hexagonal



or spindle-shaped



? Are

they smooth or papillose? Are the cells at the basal angles of the leaves (alar cells) just like the rest, or are they small and rectangular (quadrate) or greatly swollen (inflated) and transparent, or swollen and colored golden brown? Does the leaf stop abruptly at the stem, or do the edges of the leaf continue down the stem like wings (decurent)? Does the margin of

the leaf consist of long, thick-walled cells



?

THE CAPSULE. Is it straight, erect, inclined, nodding, symmetrical,

smooth or ribbed, strumose (s)



or contracted under the mouth when

dry



?

THE SETA. Is it long or short, smooth or rough, and of what color?

THE CALYPTRA. Is it cucullate



or mitrate



, hairy or smooth?

## HOW TO KNOW THE MOSSES



Figure 17. Peristome of *Bryum bimum* with appendiculate cilia, c; segment, s; tooth, t.

**THE PERISTOME.** Is it single or double? Are the teeth entire or split or irregular or absent? Are cilia present or absent?

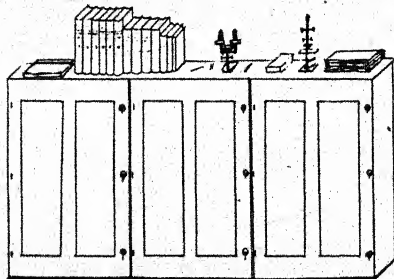
**SPORES.** Sometimes the size of the spores should be measured, or their surface noted: smooth, granulated, prickly, sculptured.

**THE ANTHERIDIA.** Wherever there is a sporophyte, or seta, there has been an egg in an archegonium. Dissect away the leaves from the base of the seta and we find the dead, unsuccessful archegonia. The antheridia may be found among the archegonia; the plant is synoicous. The antheridia may be just below the archegonia, all around; paroicous. The antheridia may be in a special cluster or bud somewhere along the stem; monoicous. If you find no antheridia on the plant that has archegonia and/or sporophytes, the species is dioicous; they will be found on another plant.

The key should do the rest. Each number in the key offers two sets of conditions a and b (sometimes also c and d). The plant cannot be like both a and b. We must decide which statement best describes it. At the end of this statement is a number to which we go next; there we again find two choices, a or b. And so we proceed until we find the genus and species of our moss, and a picture of it. We record the name on the packet — Polytrichum commune. And that packet is ready for the herbarium.

On page 134 we find the name Polytrichum commune in the Polytrichaceae, and the group Nematodontae. We may check it on this page by writing the date and place of collecting. Thus, in due time, the Systematic List becomes our check list of species found.

If you can get a good list of the mosses known to inhabit your State, underscore the names of these in the Systematic List, and/or thruout the Key; this will help in identification and will give you a goal toward which to strive. By exchange with hobbyists in other States, your collection may in due time cover the Continent, Europe, South America, or The World.





## WHAT TO LOOK FOR IN LIVERWORTS

First, some liverworts are mere green scales or ribbons lying on the ground, or floating in water. Others have stems with two rows of leaves, Fig. 13. Of these, some have a third row of small leaflike growths on the under side of the stem (underleaves).

The leaf of a liverwort may be almost perfectly round in outline, or oval or variously lobed or divided. Many species have a notch at the tip of the leaf. The shape of this notch and the shape of the two lobes are important. Sometimes there are two notches (three lobes), or four, or many. In fact the leaf may be completely divided into threadlike rows of cells. See Figs. 234 to 295.

The most critical details are 1. how the leaves are attached to the stem, 2. whether the leaf is simple or "complicate bilobed" and 3. whether the walls of the leaf cells are thin or thickened. The leaf is nearly always attached obliquely to the stem. As the stem lies horizontally this means that one edge of the leaf is attached along the upper side of the stem, the other along the lower. If that edge of the leaf that is attached to the upper side of the stem is also nearer to the tip of the stem the arrangement is called incubous, and each leaf seems to ride up over the edge of the next leaf toward the tip of the stem. If the reverse is true and the front edge of each leaf runs under the rear edge of the leaf next nearer the tip of the stem the condition is called succubous. This is by far the commoner condition.



Figure 18. Incubous leaves of *Calypogeia*.

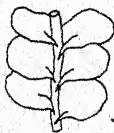


Figure 19. Succubous leaves of *Lophocolea heterophylla*.

2. A "complicate bilobed" leaf is made in two lobes and these are folded close against each other, like a creased piece of paper. If the smaller lobe is upper the condition is easily seen: a small leaf seems to lie upon a larger one. If the smaller lobe is underneath, it can only be seen by looking at the stem from beneath. This smaller lobe may be flat and leaflike, or it may be formed into a hollow sac, or it may lie against the larger lobe so as to enclose a space. This sac or space is a device for holding water.



Figure 20. Complicate bilobed leaf with the smaller lobe above the larger; *Scapania undulata*.



Figure 21. Complicate bilobed leaves seen from below, the smaller lobe being under the larger: From left to right, *Porella*, *Radula*, *Frullania*.



## HOW TO KNOW THE MOSSES

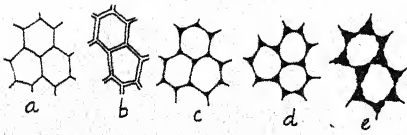


Figure 22.

3. The cells of the leaf may be equally thin-walled all around (Fig. 22a), or equally thick-walled all around (b), or with the walls thickened in the corners of the cells so as to form small (c), medium (d) or large (e) triangular masses of wall substance. Such triangular

masses are called "trigones"; they are sometimes so large as to bulge out into the cells (e).

All liverworts have round or oval or rod-shaped capsules. The round and oval ones are short-lived: they may break to pieces at maturity to let out the spores, or more often they split into four spreading quarters discharging both spores and spirally-banded threads called elaters. The seta may be an inch long, but it is weak and watery and quickly withers away. Thus, a collection with open capsules is a rare catch, for you must find it on just the right day.

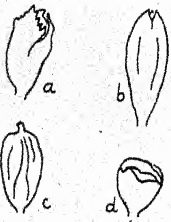


Figure 23. Perianths of *Lophocolea*, a; *Jungmannia*, b; *Frullania*, c; *Porella*, d.

The capsule originates in an archegonium (Fig. 10) as in the case of mosses proper (*Musci*). One or more archegonia are surrounded by a leaf-like sac, the perianth, (Fig. 23). This is a long-lived object, and is more useful for identification than the sporophyte itself. For there are many kinds of perianths: smooth, triangular, ridged or plaited, with the mouth plane, flat, or tubular, and perhaps fringed in various ways.

The leaves adjacent to the perianth are usually quite different from those of the vegetative shoot. These adjacent leaves are called bracts. They are often divided, lobed or toothed, even when the stem-leaves are entire. Frequently we find underleaves as bracts, even when no underleaves occur elsewhere.

Liverworts with perianths can be named fairly readily. Without perianths the problem is much more difficult.

Antheridia, oval or globular bodies containing the male germ cells (sperms), are borne in pits of the surface of the thalloid liverworts. In leafy liverworts they occur, 1 to 3 or 4, in the axil of a leaf. Such leaves usually bulge out over the antheridia, and occur in a group of 6-12 along the stem.

## BOOKS AND SPECIMENS AS MEANS OF IDENTIFICATION OF MOSSES AND LIVERWORTS

The achievement of Bryologists is preserved for us in books and collections. This little key is a possibility only because many workers have made their discoveries available. And this Key does not attempt to name every species known from North America. Beside, it is likely that species will be found that have not previously been known from this continent. Probably species new to science are still waiting to be discovered. It is certain that much collecting and identifying will have to be done before we know accurately the ranges of the different species.

The student or hobbyist will want additional books, and reliably named specimens. Here are some titles.

Grout, A. J. Mosses with a Hand-lens, ed. 3. Published by the author, Newfane, Vt. Simple keys to mosses and liverworts of New England and the Middle Atlantic States. Helpful anywhere.

Grout, A. J. Mosses with Hand-lens and Microscope. Published by the author. Abundant illustrations and excellent text, for mosses east of the 100th meridian and north of North Carolina; mosses only. Indispensably necessary.

Grout, A. J. (Editor). Moss Flora of North America. Published by the editor, Newfane, Vt. Three big volumes, describing every species in continental United States, Canada, Alaska, Newfoundland, and Greenland, and illustrating nearly every species that is not pictured in Mosses with Hand-lens and Microscope. Indispensable. One needs these three volumes, and the preceding one.

Dixon, H. N., and H. G. Jameson. Student's Handbook of \*British Mosses. A pictured key, with excellent text, covering a majority of our American mosses.

Sullivant, W. S. Icones Muscorum, and Supplement. This attempts to describe and to illustrate with superior engravings, the species of Musci not given in *Bryologia Europaea*. Hard to get.

For liverworts we have no complete treatise for North America. The nearest is

Frye, T. C. and L. Clark. Hepaticae of North America, parts 1 and 2. Part 3, completing the work, has not yet appeared.

Macvicar, S. M. Student's Handbook of British Hepatics. A pictured key, with excellent text, covering a majority of our American liverworts.

## HOW TO KNOW THE MOSSES

There are excellent keys to liverworts of the States of Washington, Oregon, West Virginia, Tennessee and Florida. Connecticut has a key to mosses and liverworts, now too old to be satisfactory; no pictures. Utah has a key to mosses. For any of these, write to Botany Department, State University.

Collections of named mosses are hard to find. The best American collections that one can hope to get are:

Sullivant & Lesquereux: Musci Boreali-americani, Ed. 1 or Ed. 2. Worth about \$100.00 a set.

Holzinger: Musci Acrocarpi Boreali-americani.

Grout: North American Musci Pleurocarpi.

Grout: North American Musci Perfecti.

or, become a member of Sullivant Moss Society, join the Moss exchange and the Hepatic exchange, and trade your own extra collections for an equal number, of your own choice, from those sent in by other members of the exchange.

A check list of mosses and liverworts of North America is available from the Editor of The Bryologist. These are the official lists of the Sullivant Moss Society.

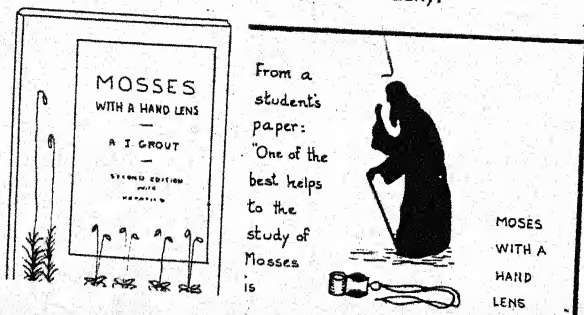
The British Bryological Society is still active. Most of its members are interested only in bryophytes of the British Isles. After the war we will doubtless resume exchanges with collectors in Europe.

Some books in foreign languages:

Limpricht, K. G. Die Laubmoose. Three volumes, with text, keys, and illustrations. Almost indispensable.

Mueller, K. Die Lebermoose. Two volumes, with text, keys, and illustrations. Almost indispensable.

Bruch, Schimper & Guembel. Bryologia Europaea. Six folio volumes with nearly 700 lithographic plates. The great Classic of Bryology. Hard to find. The text is in latin, German, and French. If you can find a set for less than \$200.00, you are lucky.



## USING THE KEYS

The keys following are intended to enable a person to determine the names of the mosses and liverworts that he finds. It is assumed that complete fruiting specimens are at hand. But if no sporophytes are available there is still a chance of getting to the proper name, especially with the liverworts. The picture helps at the final identification. Each step in the key involves two questions, rarely three or four. The questions are lettered a, b (c, d). Suppose we have a fresh complete specimen from the garden. We start at number 1a on page 24. Does 1a or 1b better describe our specimen? It fits 1a, so we proceed to 2 as indicated by the figure 2 at the end of the lines for 1a. At 2 we find that 2a best describes our specimen and we go to page 25, Class Musci. Here we begin again with 1a, 1b and 1c. We choose 1c and proceed to 3 and choose 3d, for our capsule has no peristome. This refers us to 13. Here we choose 13b, for our moss has large rectangular smooth-walled cells. We go to 75. From 75a we go to 76a and thence to the Genus *Physcomitrium*, 77. Our specimen has a seta 8mm. long, which fits into 77b and leads to 78. Here we easily choose 78a and find in Fig. 86 the details of our plant. It proves to be *Physcomitrium turbinatum*. We may find out its family relations and check it off in the Systematic List at the end of the book.

## HELPS TO THE MOSSES

1. Stems erect; seta from the end of a shoot, with the surrounding leaves little if at all modified 3 - 118.
2. Black or blackish tufts on rocks and trees: *Andreaea*, *Grimmia*, *Scouleria*, *Hedwigia*, *Ptychomitrium*, *Racomitrium*, *Orthotrichum*, *Ulota*, *Drummondia*.
3. Whitish green, in large spongy patches: *Sphagnum*, *Leucobryum*. Small, pale green: *Pohlia Wahlenbergii*; silvery, *Bryum argenteum*.
4. Leaves papillose: *Orthotrichum*, *Ulota*, *Encalypta*, *Weisia*, 60-74, 92-97, 119-142.
5. Paraphyllia conspicuous: 144-147; *Thuidium*, *Helodium*.
6. Leaf ending in a hair or bristle (long-excurrent costa): *Tortula*, *Desmatodon*, *Phascum*, *Pottia* (not mentioned in the keys), *Encalypta*, *Hedwigia*, *Grimmia*, *Polytrichum*, *Bryum*.
7. Plant dendroid, that is, like a little tree, with trunk and branches: *Climacium*, *Mnium Menziesii*, *Porotrichum*, *Pseudisothecium*, *Bryhnia novae-angliae*, *Brachythecium rivulare*.

## OUTLINE OF THE KEYS

### Musci — Part 1.

Sphagnales 2a-b

Andreaeales 1-b

Bryales 3-242

Odds and ends 3b-c, 10-12

Nematodontae 4-9

Arthrodontae 13-242

Haplolepidae 14-74

Odds and ends 14-22

Without operculum 23-29

With operculum 30-74

Leaves smooth 31-59

Without peristome

With peristome

Leaves papillose 60-74

Without peristome

With peristome

Diplolepidae 76-242

Acrocarpi 76-118

Without peristome 77-78

With single peristome 76b

With double peristome 79-118

Segments opposite the teeth 80

Segments alternate with the teeth 81-118

Leaves papillose 92-97

Leaves smooth 98-118

Pleurocarpi 119-242

Leaves papillose 119-142

Leaves smooth 143-242

With paraphyllia 144-147

Without paraphyllia 148-242

Costate (with midrib) 148-196

Ecostate (without midrib) 197-242

### Hepaticae — Part 2.

Sphaerocarpaceae 4a

Anthocerotales 4b-5

Marchantiales 7-13

Metzgeriales 14-17

Jungermanniales 18-60

Leaves filiform-cleft 19-21

Leaves entire or lobed 22-60

Leaves plane 23-46

Incubous 24-25

Succubous 26-45

Leaves complicate-bilobed 45-60

# PICTURED-KEYS

## THE CLASSES OF BRYOPHYTA (ATRACHEATA)



- 1a Plants with stem and leaves; erect, ascending, prostrate, or hanging from trees. Fig. 13; 24 to 232; 252 to 295 .....2
- 1b Plants scale-like or ribbon-like, usually fork-branched and flat on the substrate, often in rosettes, without distinction of stem and leaf; green or purplish. Figs. 13; 234 to 251 .....3
- 2a Leaves equally spaced all around the stem, usually with midrib; or in two opposite rows, with or without midrib; margins entire or toothed; never notched at apex or lobed; cells elongate to isodiametric. Sporophyte persisting for weeks or months. No elaters. Figs. 24 to 232. Class 1 MUSCI ..... page 25
- 2b Leaves in two rows near upper side of stem, without midrib, and with cells isodiametric. Leaves often notched at apex, or lobed, or cut into thread-like lobes, sometimes with a smaller lobe folded against a larger one. Sporophyte short-lived, the capsule raised on a stalk, splitting into four parts, emitting spores and slender elaters with spiral bands. Figs. 252 to 295. Class 2 HEPATICAE, Order JUNGERMANNIALES ..... page 116
- 3a Plant flat on the ground; each cell with one large chloroplast. Sporophyte persisting for weeks or months, rod-like, projecting from a cylindrical sheath, splitting above into two parts to discharge spores and 2-4-celled irregular elaters. Figs. 234 and 235. Class 3 ANTHOCEROTAE page 110
- 3b Cells with numerous small chloroplasts. Sporophyte a globular or slightly elongate capsule with or without a fragile watery stalk, lasting only a few days. Figs. 236 to 251. Class 2 HEPATICAE ..... page 109



## HOW TO KNOW THE MOSSES

### CLASS MUSCI THE MOSSES

1a (b, c) Capsule raised on a pseudopodium, spherical, black, shedding a round lid explosively. Leaves whitish, very porous and absorbent. Loose tangles and masses in bogs or wet places. (Peat mosses) Order 1. SPHAGNALES, Family SPHAGNACEAE, Genus SPHAGNUM. Figs. 25, 26. 2

1b Capsule raised on a pseudopodium, cylindric, brownish black, opening along the middle by four longitudinal slits. Leaves minute, stiff, blackish, with very thick cell walls. On rocks, in mountains. (The black mosses) Fig. 24. Order 2. ANDREAEALES, Family ANDREAEACEAE, Genus ANDREAEA



Figure 24

Fig. 24. Andreaea rupestris Hedw. a, plant; b, an open capsule; c, leaf and cells; d, calyptra; e, leaf of Andreaea Rothii W. & M. — The five species found in North America are very much alike: shiny brownish black tufts a half inch tall, on igneous rocks, at 3000 ft. altitude in North Carolina, 2000 ft. in Vermont. Rare in the Rocky Mts.

1c Capsule on a stiff stalk or seta of sporophyte tissue above the foot, or nestled among the leaves without a visible seta, opening by shedding a circular lid or breaking irregularly. No pseudopodium. Super-order BRYALES. Figs. 27 to 232 ..... 3

2a Stem clothed with 2 or 3 layers of empty cells with spiral lines on the walls. Branchlets stout, in large heads Fig. 25 ..... S. palustre

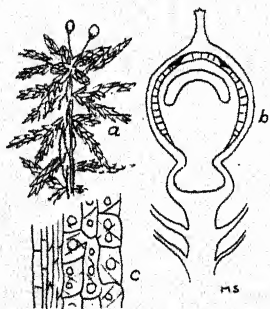


Figure 25

Fig. 25. Sphagnum palustre L. a, plant with capsules; b, capsule, foot and pseudopodium; c, outer cells of stem. This moss grows in big beds and cushions, often covering acres of bog, the living parts up to a foot tall, crowded, supporting one another. There are 6 similar species in North America. Sphagnum is associated with cranberries, sundews and some of our loveliest orchids.

# HOW TO KNOW THE MOSSES

- 2b Stem clothed with 2 or 3 layers of empty cells without spiral fibers on the walls. Branchlets slender, tapering to a fine point; often purplish.

Fig. 26. S. capillaceum

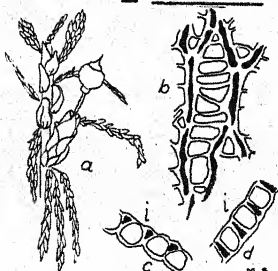


Figure 26

Fig. 26. Sphagnum capillaceum (Weiss) Schrank. a, plant; b, cells of leaf; c, section of leaf; d, section of leaf of S. cuspidatum Ehrh.; e, inner (upper) surface of leaf. These mosses often cover acres of bog, amongst cranberry plants. All Sphagnums are useful for packing trees and shrubs for shipment. By their growth and decay they form peat, about a foot in 100 years. There are 10 other species in North America similar to S. capillaceum and 20 similar to S. cuspidatum.

- 3a (b, c, d) Mouth of capsule beset with teeth (peristome) in a single row, the number being either 4 or 32 to 64 (never 8 or 16), each tooth being made up of many cells lying lengthways of the tooth; teeth without transverse bars or lines. Figs. 27 to 33. NEMATODONTEAE ..... 4
- 3b Peristome double, the inner being a conspicuous conical plaited membrane, the outer of numerous rod-like rows of cells, or rudiments of these. Capsules oblique and unsymmetric. On wooded banks rich in humus. Saprophytic. Fig. 34. Family BUXBAUMIACEAE ..... 10
- 3c Mouth of capsule with one row of wedge-shaped or linear teeth, each tooth composed of 2 or 3 layers of cells with their walls transverse and longitudinal to the tooth. Leaf cells very large. Odd mosses growing on dung of various animals in cold regions. Figs. 35, 36. Family SPLACHNACEAE ..... 11
- 3d Mouth of capsule with one or two rows of membranous teeth (no whole cells), or without teeth, or capsules with no provision for opening. Teeth usually with transverse bars or lines. Figs. 37 to 232. ARTHRODONTEAE ..... 13
- 4a Teeth 4, capsule cylindric. Leaves small, ovoid, pointed, with midrib and isodiametric cells. Fig. 27. Family TETRAPHIDACEAE, Genus TETRAPHIS

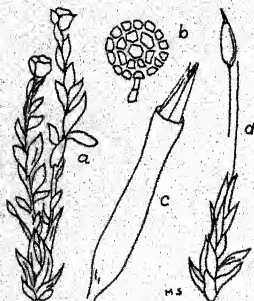


Figure 27

Fig. 27. Tetraphis pellucida Hedw. a, plant with gemma cups; b, gemma; c, capsule with peristome; d, capsule, seta and perichaetial leaves. — This genus has the smallest number of teeth in the peristome. The plants grow in tufts and sods in deep shade on wet rotten wood or humus or porous sandstone. The protonema is a green scale, not filamentous. Common from eastern N. J. to Calif. and northward. T. geniculata Gignens., a more northern form, has a crooked seta.



## HOW TO KNOW THE MOSSES

- 4b Teeth 32 to 64, their tips attached to a thin membrane covering the mouth of the capsule. Leaves with upright green lamellae on the upper surface along the midrib. Figs. 28 to 33. Family POLYTRICHACEAE 5
- 5a (b,c) Lamellae 7 or fewer or almost obsolete; capsules cylindrical; calyptra perfectly smooth; teeth 32. Figs. 28 and 29.  
Genus *ATRICHUM* ..... 6
- 5b Lamellae 10 to 70, their end cells in cross section papillose; capsules cylindrical; calyptra hairy; teeth 32 to 64.  
Figs. 30, 31. Genus *POGONATUM* ..... 7
- 5c Lamellae 20 to 70; capsules 4- or 6-angled lengthways; calyptra hairy; teeth 64. Figs. 32, 33. Genus *POLYTRICHUM* ..... 9
- 6a Lamellae 4 to 7, tall enough to cover more than half of the leaf; cells of leaf .01 - .015mm. in longest diameter. Fig. 28 .. *Atrichum angustatum*

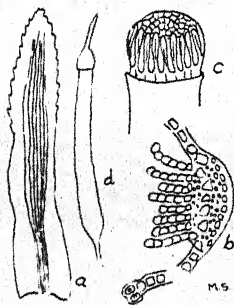


Figure 28

Fig. 28. *Atrichum angustatum* (Brid.) Bry. Eur. a, leaf with lamellae; b, cross section of leaf; c, peristome; d, capsule with operculum. *A. Macmillani* (Holz.) Frye is a small, dense form, with papillae on leaves and lamellae, visible only with a 1/6 inch objective. — Stems 1/2 to 2 in. tall, often in wide sods. Very common on half-shaded hard soil in northeastern U. S.

- 6b Lamellae 2 to 6, very low, 2 to 6 cells high; cells of leaf .018-.04 mm. in longest diameter. Fig. 29. .... *A. undulatum*

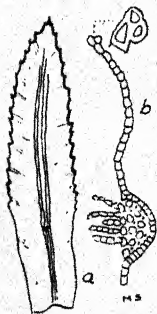


Figure 29

Fig. 29. *Atrichum undulatum* (Hedw.) Beauv. a, leaf with lamellae; b, cross section of leaf. — Very common east of the Great Plains; in moist shady places. Capsules mature in autumn, open in spring. Stems 1-2 in. tall, seta 1-1 1/2 in., capsule 1/4 in. long, purple-red. *A. undulatum* var. *Selwynii* (Aust.) Frye is intermediate between the other two in height of lamellae. *A. crispum* (James) Sull., Vt. to N. J. and Tenn., and B. C. to Oregon, has lamellae 0-4, 1-3 cells high, leaves smooth; grows on wet peaty soil in shade.

# HOW TO KNOW THE MOSSES

- 7a Stem obsolete; seta  $\frac{1}{2}$ -1 in. tall, from a tiny tuft of leaves on a green bed of filamentous protonema. Fig. 30 ..... P. pensilvanicum

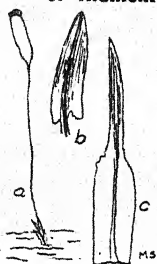


Figure 30

Fig. 30. Pogonatum pensilvanicum (Hedw.) Paris. a, plant, natural size; b, leaf enlarged; c, leaf of P. brachyphyllum (Rich.) Beauv. — This moss covers clayey banks with its green perennial protonema, from N. J. to s. e. Iowa. P. brachyphyllum is similar, in the southeast. Only with care does one find the leaves at the base of the seta.

- 7b Stems up to (1) 2 to 4 (8) in. tall, sometimes branched; leaves  $\frac{1}{4}$  to  $\frac{1}{2}$  in. long; New England to the Rocky Mts. and Pacific coast ..... 8

- 8a Teeth of peristome 32; capsule without stomata.

- Fig. 31. .... P. urnigerum

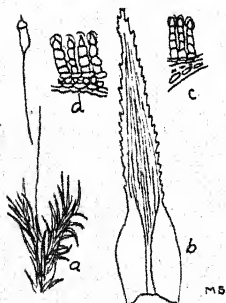


Figure 31

Fig. 31. Pogonatum urnigerum (Hedw.) Beauv. a, plant; b, leaf; c, cross section of lamellae; d, cross section of lamellae of P. alpinum (Hedw.) Roehl. Four other species of Pogonatum occur in North America. They occur in mountains in New England, but quite generally from Wash., to Alaska, and in n.w. Europe. P. contortum has the leaves very curly when dry.

- 8b Teeth of peristome 40 to 60; capsule with stomata.

- Fig. 31 ..... P. alpinum

- 9a Margins of leaf translucent and rolled over the upper surface of the leaf completely covering the lamellae. Fig. 32 ..... Polytrichum juniperinum

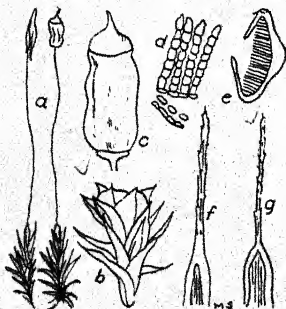


Figure 32

Fig. 32. Polytrichum juniperinum Hedw. a, fruiting plant; b, antheridial head; c, capsule; d, cross section of lamellae; e, cross section of leaf; f, apex of leaf; g, apex of leaf of P. piliferum, which is otherwise very much like P. juniperinum. — P. juniperinum is very common all over the Northern Hemisphere. P. piliferum requires silicious sand or rocks, and full sunshine; found at sea level on Long Island, and at 12,500 ft. in Colorado.

## HOW TO KNOW THE MOSSES

- 9b Margins of leaf scarcely taller than lamellae, toothed to middle of leaf at least; capsule nearly cubical. Fig. 33 ..... P. commune

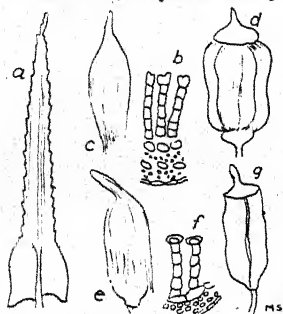


Figure 33

Fig. 33. Polytrichum commune Hedw. a, leaf; b, section of lamellae; c, calyptra enclosing a capsule; d, capsule alone; e, capsule and calyptra of P. ohioense R. & C.; f, section of lamellae; g, capsule alone. — The Haircap or Pigeonwheat mosses grow in beds often 100 ft. across, and up to 6 in. tall. Leaves to ½ in. long. Common. Five other species are similar to the above, northern in distribution.

- 10a Oblique, pointed, green capsules with whitish tip, sitting on beds of dark humus; leaves minute, tongue-shaped, blackish, papillose; perichaetial leaves bristle-like. Fig. 34. .... Diphyscium foliosum

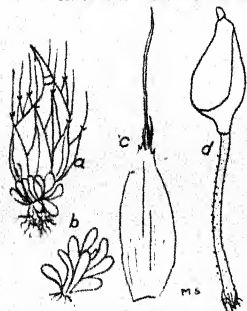


Figure 34

Fig. 34. Diphyscium foliosum (Hedw.) Mohr. a, plant; b, leaves; c, perichaetial leaf; d, plant of Buxbaumia aphylla Hedw. — This and two other species of Buxbaumia are found from New England to Washington; another is strictly northwestern. All are rare finds. The capsule of Buxbaumia has been likened to a bedbug on a stalk!

- 10b Flat, red-purple capsule perched obliquely or horizontally on a seta ½ in. tall; apparently leafless. Fig. 34. .... Buxbaumia aphylla

- 11a Peristome teeth 3-layered; basal part of capsule wider than urn and darker in color. Fig. 35. .... Genus SPLACHNUM

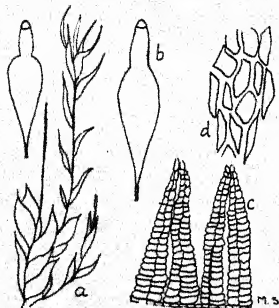


Figure 35

Fig. 35. Splachnum ampullaceum Hedw. a, plant; b, capsule; c, peristome; d, cells of leaf. On cow dung in swamps, Newfoundland to Penna. and Wis. — S. luteum Hedw. on the same substrate, in Rocky Mts. and northwest, wears a yellow, bell-shaped skirt below the small red capsule. There are three other species. They are said to emit a manurial odor and thus to attract flies which carry the spores.

# HOW TO KNOW THE MOSSES

11b Peristome teeth 2-layered .....12

12a Basal part of capsule (hypophysis) narrower than urn and of the same color. Fig. 36. ....Genus Tayloria

12b Basal part of capsule wider than urn and lighter in color.

Fig. 36. .... Genus Tetraplodon

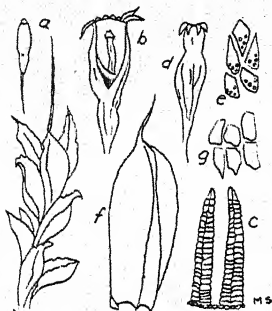


Figure 36

Fig. 36. Tayloria serrata (Hedw.) Bry. Eur. a, plant; b, capsule; c, peristome; d, cells of leaf, Vt. to Oreg. and Alaska. Tetraplodon mnioides (Hedw.) Bry. Eur. d, capsule; e, cells of leaf; f, leaf. — Tayloria has 5 species, Tetraplodon 4, on dung of various animals, N. Y. to Wash., Alaska and Greenland. The columella of Tayloria often extends prominently above the mouth of the capsule.

13a Peristome consisting of a single row of teeth, each composed (at least at base) of two layers of plates: in the outer layer a single plate forms the width of the tooth; in the inner two plates go to form the width of the tooth; hence the tooth seen from the inner side shows a fine longitudinal line. If without teeth or indehiscent, the leaf cells are elongate, pointed and smooth, or small and very thick walled. Fig. 37. See footnote, page 31. Sub-class Haplolepideae .....14

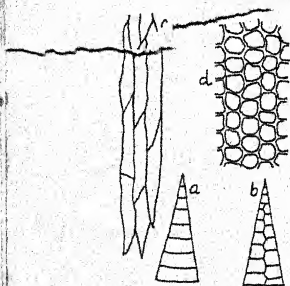


Figure 37

Fig. 37. Haplolepideae. a, outer surface of tooth; b, inner surface of tooth; c, elongate pointed cells of Lepetobryum; d, small, thick-walled cells of Grimmia.

13b Peristome characteristically in two circles: an inner thin membrane divided into segments and filiform cilia, an outer of 16 (or 8) firm teeth. A tooth is composed (at least at base) of two layers of plates: in the outer layer two plates go to form the width of the tooth; the outer surface therefore shows a fine longitudinal line. In the inner layer a single plate forms the width of the tooth. If without teeth or indehiscent the leaf cells are large, isodiametric, or sharply rectangular,

## HOW TO KNOW THE MOSSES

and smooth walled. If inner peristome is lacking, the structure of the teeth will tell. Fig. 38. See footnote. . . . Sub-class Diplolepideae 75

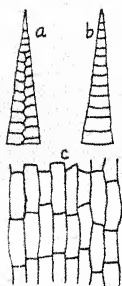


Fig. 38. Diplolepideae, a, outer surface of tooth; b, inner surface of same; c, large rectangular cells of Physcomitrium.

Figure 38

14a Leaves in two rows on opposite sides of stem, each leaf split at base and clasping stem and next leaf above (equitant). Figs. 39-43.

Family Fissidentaceae. Genus Fissidens . . . . . 15

14b Leaves attached to stem in three or more rows, or if in two rows not apparently split. Figs. 44-111. . . . . 19

15a Attached to rocks in swift shallow water (strong springs).

Fig. 39. . . . . F. grandifrons

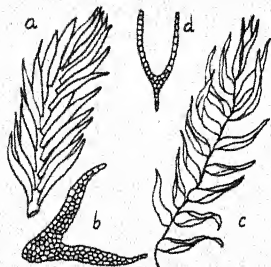


Figure 39

Fig. 39. Fissidens grandifrons Brid. a, stem with leaves; b, cross section of leaf; c, plant of F. Julianus (Mont.) Schimp.; d, cross section of leaf. — The first of these is a stiff, dark green plant, 1-5 in. long, in swiftly flowing calcareous water. The second is limp and soft, 2-6 in. long. Two other aquatic species are sometimes found.

### Footnote.

Thirteen is an unlucky number! The hurdle at this point is difficult. If your specimen has no capsules, determine whether the stems are erect and little branched, or creeping and branching freely. Then try the following:

1a Stems erect; sporophytes terminal. Figs. 39-111.

1b Stems creeping and branching freely; sporophytes from lateral buds. Figs. 112-232.



# HOW TO KNOW THE MOSSES

15b On earth or moist rocks, not in water ..... 16

16a In dense sods, on bases of trees; shoots to  $\frac{1}{2}$  in. long, curved toward substrate when dry, the upper margin irregularly toothed; midrib ceasing 10-12 cells from apex of leaf. Fig. 40 ..... F. subbasilaris

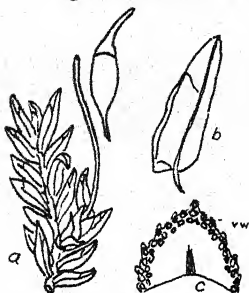


Figure 40

Fig. 40. Fissidens subbasilaris Hedw. a, plant with capsule; b, leaf; c, apex and margin of leaf. Ont. and Conn. to the Gulf, and to s. e. Iowa. First collected near Lancaster, Penna. The sporophyte comes from near the base of the stem.

16b On earth or rocks. .... 17

17a (b, c) Margin of leaf composed of very slender, long cells.

Fig. 41. .... F. bryoides



Figure 41

Fig. 41. Fissidens bryoides Hedw. a, plant with capsule; b, leaf; c, apex of leaf, and margin. — Stems 5 to 25 mm. tall; mostly on soil. F. minutulus Sull. is similar, only 1-3 mm. tall, very common on damp rocks. Very similar are F. viridulus (W. & M.) Wahlenb. of the north and northeast, F. limbatulus Sull. of the West Coast, and 5 rarer species.

17b Margin of leaf irregularly toothed at apex, pale by reason of 3 or 4 rows of pale cells. Fig. 42. .... F. cristatus

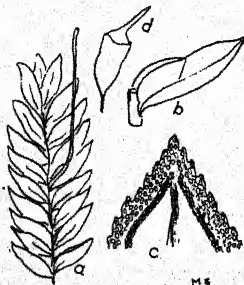


Figure 42

Fig. 42. Fissidens cristatus Wils. a, plant; b, leaf; c, leaf apex and margin; d, capsule. — Stems 1-3 cm. tall, usually in dense beds in rich woods; seta 1-4 mm. long. Cells of leaf .006-.01 mm. across. Common east of the Rockies, and in Europe and Asia. F. adiantoides Hedw. is very similar, with cells of leaf about .015 mm. in diameter; range similar, but more northern.

## HOW TO KNOW THE MOSSES

17c Without specialized border-(marginal-) cells. ....18

18a Leaf entire, rounded at apex. Fig. 43. ....F. obtusifolius

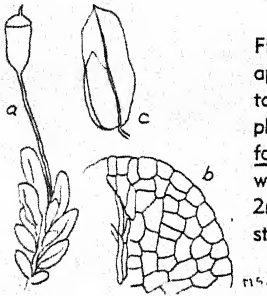


Figure 43

Fig. 43. Fissidens obtusifolius Wils. a, plant; b, apex and margin of leaf. — Stems 2-3 (-10) mm. tall; on damp rocks. Eastern U. S. to Kansas. Sporophyte from the tip of the stem. c, leaf of F. taxifolius, common on earth and rocks, eastern U. S. and western Europe. Stems 5-20 mm. long; leaves about 2mm. long. Sporophyte from near the base of the stem.

18b Leaf finely toothed by projecting angles of cells,

Fig. 43. ....F. taxifolius.

19a Calyptra longer than capsule, cylindric, contracted above to a rod-like tip, long persistent; peristome absent, single or double; leaves ovate or tongue-shaped, opaque by reason of densely crowded compound papillae. Figs. 44, 45. Family Encalyptaceae. ....Genus Encalypta 20

19b Without the above combination of characters .....22

20a Calyptra with a fringe of pointed teeth around the margin; teeth of peristome 16, Fig. 44. ....E. ciliata

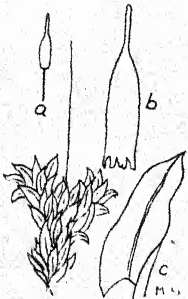


Figure 44

Fig. 44. Encalypta ciliata Hedw. a, plant; b, calyptra; c, leaf. — On or among rocks, northern states and Canada, Atlantic to Pacific. In dense tufts, with stems 1-3 cm. tall and seta 1 cm. The calyptra of these mosses so resembles the extinguisher of a candle that they are sometimes called "Extinguisher Mosses".

20b Calyptra smooth at margin, or irregularly torn, not neatly fringed. . .21

21a Capsule spirally furrowed when dry; midrib not quite reaching apex of leaf. Fig. 45. ....E. streptocarpe

## HOW TO KNOW THE MOSSES

- 21b Capsule with straight longitudinal ridges and furrows; midrib of leaf extended as a needle-point. Fig. 45. .... E. rhabdocarpa

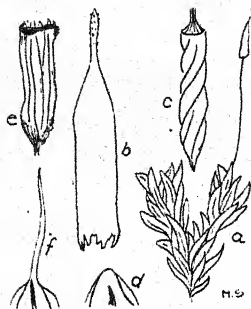


Figure 45

Fig. 45. Encalypta streptocarpa Hedw. a, plant; b, calyptra; c, capsule; d, apex of leaf; e, capsule and f, tip of leaf of E. rhabdocarpa. — The latter species is northwestern, the former northeastern. Only mature dry capsules show the spiral furrows.

- 22a Spores 20 to 30, about 0.2 mm. in diameter, the largest known among mosses; capsule spherical, indehiscent, without columella; seta lacking. Plants 5-10 mm. tall; leaves narrowly lanceolate.

Fig. 46. .... Family Archidiaceae. .... Genus Archidium

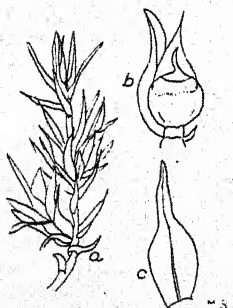


Figure 46

Fig. 46. Archidium ohioense Schimp. a, plant; b, capsule; c, leaf. — Five other species are known in the eastern United States, mostly southeastern. The one figured ranges from Quebec to Minnesota, Texas and Florida. Campbell considered this a unique and primitive moss. We now consider it a degenerate form.

- 22b Spores much smaller and much more numerous; capsule with a columella. Figs. 47 - 111. .... 23
- 23a Minute mosses, mostly without operculum or visible seta; stems up to 5 mm. tall. Figs. 47 - 51. .... 24
- 23b Larger mosses with visible seta, the capsule with a distinct operculum. Figs. 52 - 111. .... 30



## HOW TO KNOW THE MOSSES

- 24a Upper cells of leaf papillose. Figs. 47, 48. .... 25
- 24b Upper cells of leaf smooth, not papillose. Figs. 49 - 51. .... 27
- 25a Cells small and indistinct. Fig. 48. .... 26
- 25b Cells distinct; papillae large, few. Fig. 47. .... Genus Ephemerum

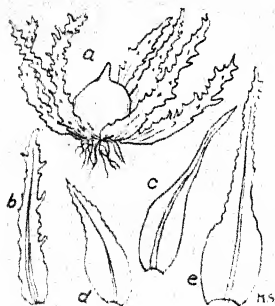


Figure 47

Fig. 47. Ephemerum spinulosum. Schimp. a, plant; b, leaf; c, leaf of E. crassinervium (Schw.) C. M.; d, leaf of E. cohaerens (Hedw.) Hampe; e, leaf of E. sessile (Bry. Eur.) Rabenh. — These mosses, barely visible to the naked eye, grow in crowds on silty banks and in gardens. They are detected by the olive green patches of protonema which they form. Only recognizable in autumn.

- 26a Leaf margin inrolled; leaves curled up when dry.

Fig. 48. .... Genus Astomum

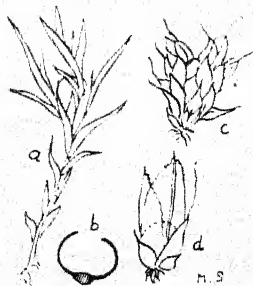


Figure 48

Fig. 48. Astomum Muhlenbergianum (Sw.) Grout. a, plant; b, cross section of leaf, dry; c, plant of Phascum cuspidatum var. americanum R. & C.; d, plant of Acaulon rubrum (Roehl) Grout. These pygmy mosses grow in dense clusters on clods or bare bits of earth among grasses, fruiting in April and May. To find them tests your skill as a collector. — Acaulon has broad leaves with no awn.

- 26b Leaf margin plane; leaves awned at tip. Fig. 48. .... Genus Phascum

- 27a Leaves almost filiform, the cells much longer than wide.

Figs. 49, 50. .... 28

- 27b Leaves oval to lanceolate, the cells cubical or rectangular; capsules spherical. Figs. 47, 51. .... 29

## HOW TO KNOW THE MOSSES

28a Capsule spherical, without neck. Fig. 49. .... Genus Pleuridium

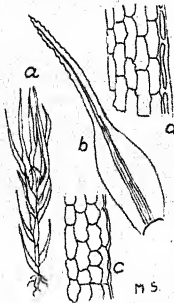


Figure 49

Fig. 49. Pleuridium subulatum (Hedw.) Lindb. a, plant; b, leaf enlarged; c, cells of leaf; d, similar leaf-cells of P. acuminatum Lindb.; — These pygmies (2-5 mm. tall) occur in dense velvety clusters amongst grasses and weeds, fruiting in May. There are 7 species of Pleuridium in North America, from Atlantic to Pacific, and Canada to the Gulf.

28b Capsule with neck as long as urn; leaves broad at base.

Fig. 50. .... Genus Bruchia

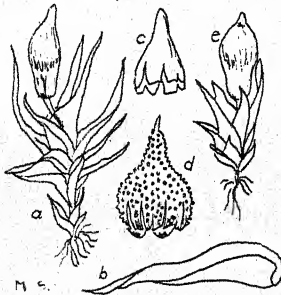


Figure 50

Fig. 50. Bruchia Sullivanti Aust. — a, plant; b, leaf; c, calyptra; d, calyptra of B. Ravenelii Wils; e, plant of B. brevifolia. — The first of these is found from Maine to Minn. and the Gulf; the other two are southeastern, N. C. to Tex. All are very small, not over 3 mm. in total height, mostly gregarious, fruiting in spring. Eleven species are recorded for North America; very rare on the Pacific slope.

29a Leaves oval, the cells rectangular. Fig. 51. .... Genus Aphanorhagma

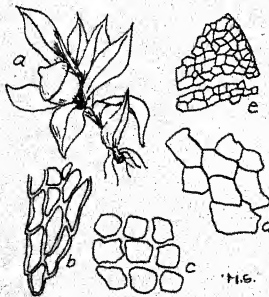


Figure 51

Fig. 51. Aphanorhagma serratum (Hook. and Wils.) Sull. a, plant; b, cells of leaf; c, cells of outer wall of capsule, with thickened walls; d, cells of capsule of A. patens (Hedw.) Lindb.; e, line of dehiscence of A. patens. These mosses are often very abundant on silty banks and bottoms along rivers, in late autumn.

29b Leaves lanceolate; leaf cells elongate - hexagonal to rhombic.

Fig. 47. .... Genus Ephemerum See 25b

# HOW TO KNOW THE MOSSES

- 30a Leaves smooth, not papillose. Figs. 51-73. ....31
- 30b Leaves papillose. Figs. 74-98. ....60
- 31a (b, c) Peristome lacking; leaves oval, cells rectangular, distinct and transparent. Fig. 51. ....Aphanorhegma serratum.
- 31b Peristome lacking; dark, coarse moss on rocks.  
Fig. 52. ....Genus Hedwigia

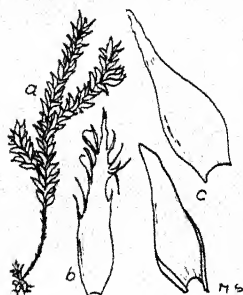


Figure 52

Fig. 52. Hedwigia ciliata Hedw. a, plant; b, leaf of perichaetium; c, leaves with and without awn point, without midrib. — Common on rocks, Arctic to Mexico, also in Europe. The typical form of this moss has a distinct white awn at the tip; when this is lacking we have forma viridis. The branching, sprawling habit of this moss makes it look like a Pleurocarp.

- 31c Peristome present, distinct, of 16 teeth. Figs. 53-73. ....32
- 32a (b, c, d, e) Peristome teeth, entire and undivided, equally spaced around urn; whole plant 3-5 mm. tall. ....Genus Seligeria

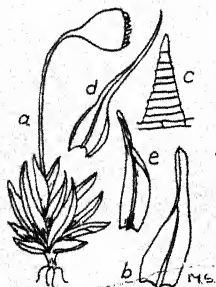


Figure 53

Fig. 53. Seligeria campylopoda Kindb. a, plant; b, leaf; c, peristome tooth; d, leaf of S. pusilla (Hedw.) Bry. Eur.; e, leaf of S. calcarea (Hedw.) Bry. Eur. — S. Doniana (Smith) C. Muell. has no peristome. These tiny mosses grow in velvety coatings on cool shaded rocks, often in deep crevices. They are barely visible, and have to be scraped off the rock with a knife-blade.

- 32b Peristome teeth entire in pairs; plants in blackish tufts on rocks, 7-10 mm. tall; calyptra large, ridged and furrowed, lobed at base. Southeastern U. S. Fig. 13. ....Ptychomitrium incurvum.
- 32c Peristome teeth, neatly split in two for about half their length.  
Figs. 54-62. ....33

## HOW TO KNOW THE MOSSES

- 32d Peristome teeth neatly split to the base into two thread-like parts, sometimes with transverse bars between. Figs. 63-66. ....45
- 32e Peristome teeth perforated along the middle, or irregularly and variously split. Figs. 67-73. ....49
- 33a Leaves whitish, composed of 2 or 3 layers of large empty cells, with tiny chlorophyll-cells packed into the corners; capsule strumose. Fig. 54. ....Genus Leucobryum

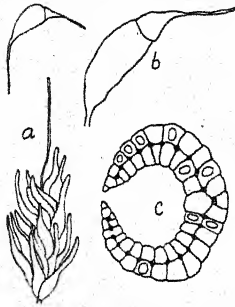


Figure 54

Fig. 54. Leucobryum glaucum (Hedw.) Schimp. a, plant with capsule; b, capsule; c, cross section of leaf. — This big cushion-moss often forms spongy discs and sods 3 or 4 inches deep, and covering a whole hillside. Capsules are rarely seen, ripening in autumn. In Florida L. albidum (Brid.) Lindb. is more common, and on trees grows the similar looking Octoblepharum albidum Hedw., with 8 peristome teeth.

- 33b Leaves green, only one cell thick .....34
- 34a Leaves with enlarged, often colored, cells at basal angles. Figs. 55-58. ....35
- 34b Cells at basal angles of leaves (alar cells) not swollen or colored. Figs. 59-62. ....Genus Dicranella. ....41
- 35a Capsule strumose. Fig. 55. ....Genus Oncophorus

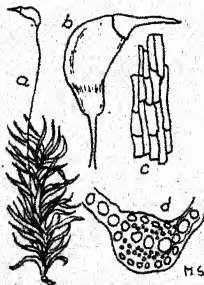


Figure 55

Fig. 55. Oncophorus Wahlenbergii Brid. a, plant; b, capsule; c, alar cells; d, cross section of leaf. — Tufts of silky texture, in cool mountainous regions. Nine other species are known in North America, O. polycarpus (Hedw.) Brid. and O. virens (Hedw.) Brid. are frequent northward and in the Rocky Mts. O. polycarpus has a furrowed capsule, suberect, usually not strumose.

- 35b Capsule not strumose. Figs. 56-58. ....Genus Dicranum. ....36

# HOW TO KNOW THE MOSSES

36a Capsule erect; plants with many slender erect scaly shoots (flagella).

Fig. 56. .... D. flagellare



Fig. 56. Dicranum flagellare Hedw. a, plant with capsule and flagella; b, cells from upper part of leaf; c, apex of leaf; d, leaf base, showing relative width of midrib. — In dense cushions and sods, to 1 inch thick, on rotten wood, in damp, shady places. In all of North America except the extreme s. e. and s. w.; also in Europe.

Figure 56

36b Capsules curved; without scaly shoots (flagella) ..... 37

37a Upper leaf cells 1-2:1, their walls not pitted ..... 38

37b Upper leaf cells elongated, with thick pitted walls ..... 39

38a Leaves all bent to one side, curly when dry. Fig. 57. .... D. fuscescens

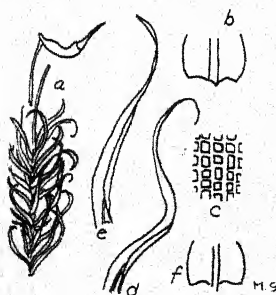


Fig. 57. Dicranum fuscescens Turn. a, plant; b, base of leaf showing relative width of midrib; c, upper cells of leaf; d, the dry curly leaf of D. fuscescens; e, dry leaf of D. condensatum Hedw.; f, base of leaf of D. condensatum. — D. fuscescens is common along the northwest coast, D. condensatum in the southeast, from N. J. and Ark. southward.

Figure 57

38b Leaves nearly straight, not bent to one side. Fig. 57. . . D. condensatum

39a Leaves crinkled (undulate); setae 2 or more from one stem. . D. rugosum

39b Leaves plane, not, or scarcely, undulate. .... 40

40a Very large for the genus; stems clothed with whitish wool; setae two or more from one stem. .... D. majus

# HOW TO KNOW THE MOSSES

- 40b Smaller; seta 1; leaves with 2-4 toothed ridges on the back of the midrib. Very common. Fig. 58. .... D. scoparium

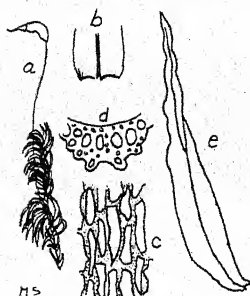


Figure 58

Fig. 58. Dicranum scoparium Hedw. a, plant; b, base of leaf showing width of midrib; c, upper cells of leaf; d, cross-section of midrib; e, leaf of D. Bonjeani DeNot. — Large, common mosses in dense shiny clumps, green to yellowish green, up to 3 inches tall. Almost universal in the north temperate zone.

- 41a Leaves from an enlarged clasping base, squarrose.

Fig. 59. .... D. Schreberi

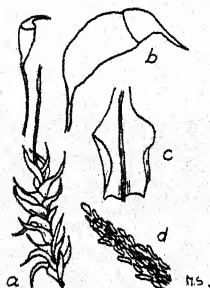


Figure 59

Fig. 59. Dicranella Schreberi (Hedw.) Schimp. a, plant; b, capsule with lid; c, leaf base; d, leaf apex. — In silky tufts about an inch tall, Penna. to Oregon and B. C. Three other species have the wide clasping base of leaf, with leaves squarrose-recurved. D. squarrosa grows in wet ground and in bogs; northern.

- 41b Base of leaf not clasping; not squarrose. .... 42

- 42a Apex of leaf blunt, rounded, the midrib ending below it.

Fig. 60. .... D. Hilariana

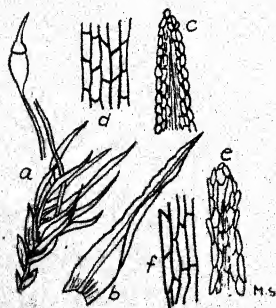


Figure 60

Fig. 60. Dicranella Hilariana (Mont.) Mitt. a, plant; b, leaf; c, apex of leaf; d, median cells of leaf; e, leaf apex, and f, median cells of D. Herminieri Besch. — Moist banks and sides of ditches, S. Carolina to Fla. and La., the two species often growing together. D. Hilariana extends to S. America.



# HOW TO KNOW THE MOSSES

42b Apex of leaf mostly acute, with midrib percurrent or excurrent. . . . .43

43a Capsules erect when dry and empty. Fig. 61. . . . .D. rufescens

43b Capsules inclined and unsymmetric. Fig. 61, 62. . . . .44

44a Capsules smooth when dry and empty, the mouth not oblique; leaves straight, the upper part made of two layers of cells. Fig. 61. . .D. varia

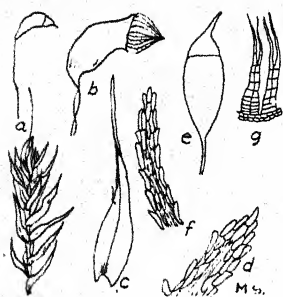


Figure 61

Fig. 61. Dicranella varia (Hedw.) Schimp. a, plant; b, capsule and peristome; c, leaf; d, apex of leaf; e, capsule, and f, apex of leaf of D. rufescens (Smith) Schimp; g, peristome of same. — Capsules smooth, not furrowed. D. rufescens has a plump, erect capsule and clear (pellucid) cells composing the leaf; the cells of other Dicranellas are densely chlorophyllose. D. varia appears on freshly exposed clay all over the continent; D. rufescens Va. to Wash., N. B. and Alaska.

44b Capsule with longitudinal ridges and furrows, the mouth oblique; leaves all bent to one side. Fig. 62. . . . .D. heteromalla

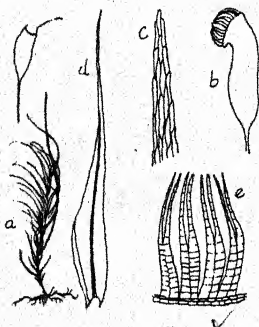


Figure 62

Fig. 62. Dicranella heteromalla (Hedw.) Schimp. a, plant; b, capsule; c, apex of leaf; d, leaf; e, peristome. This moss is very abundant on wooded banks in the eastern U. S., often covering many square yards with a silky green carpet. The "chuck under the chin" makes the mouth of the dry capsule oblique.

45a Neck of capsule as long as urn or longer.

Fig. 68. . . . .Trematodon ambiguus

45b Neck of capsule not noticeable. . . . .46

## HOW TO KNOW THE MOSSES

46a Peristome teeth spirally twisted, from a tessellated tube.

Fig. 63. .... *Tortula mucronifolia*

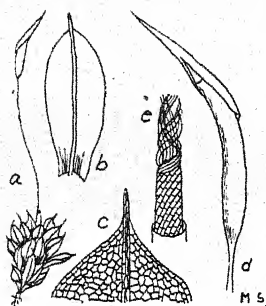


Figure 63

Fig. 63. *Tortula mucronifolia* Schw. a, plant; b, leaf; c, apex of leaf; d, capsule with calyptra; e, peristome. — In small patches on earth in woods and on banks, Greenland to Alaska, N. Y., Iowa, N. Mex. and Calif. Easily recognized in fruit. The shape and apex of leaf and the clear cells of the basal  $\frac{1}{4}$  of the leaf, with revolute margins in this region, are unique. The peristome is a beautiful thing, the brick red twisted filaments shading off to the nearly white tube below.

46b Peristome teeth straight, or arching over mouth of capsule. .... 47

47a Capsule smooth, erect. Figs. 65, 66. .... Genus *Ditrichum*. .... 48

47b Capsule inclined to horizontal, with longitudinal ridges and furrows.

Fig. 64. .... Genus *Ceratodon*

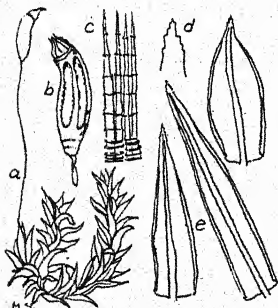


Figure 64

Fig. 64. *Ceratodon purpureus* (Hedw.) Brid. a, plant; b, capsule; c, peristome; d, apex of leaf; e, extreme forms of leaf. — This cosmopolitan moss is perfectly characterized by the leaf with margins revolute up to the plane and few-toothed tip, the inclined, furrowed capsule, and the peristome. It grows mostly in very dry places; on walls, sidewalks, dry ground, but also in purple tufts in lawns, and even in swamps.

48a Leaves long-filiform; seta 1-2 cm. tall, yellow. Fig. 65. ... *D. pallidum*

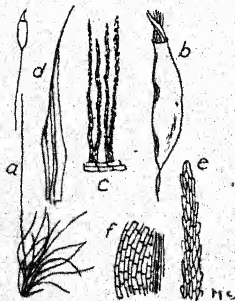


Figure 65

Fig. 65. *Ditrichum pallidum* (Hedw.) Hampe. a, plant; b, capsule; c, peristome; d, leaf; e, apex of leaf; f, basal cells. Common in dry grassy places, eastern U. S., making conspicuous little silky sods, with long yellow setae. Also in Europe.

## HOW TO KNOW THE MOSSES

- 48b Leaves about 1 mm. long, rather stiff; seta 1 cm. long or less, red-brown. Fig. 66. .... D. pusillum

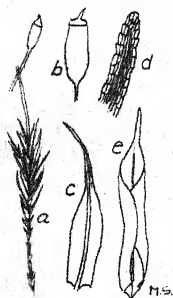


Figure 66

Fig. 66. Ditrichum pusillum (Hedw.) E. G. B. a, plant; b, capsule; c, leaf; d, apex of leaf; e, perichaetial leaf of D. lineare (Sw.) Lindb. — Both species occur on freshly exposed clay, the former Labr. to Alaska, Calif. and the Gulf, the latter N. B. to S. C. and Mo. They sometimes grow together and merge into each other.

- 49a Leaves in two ranks, filiform above. Fig. 67. .... Genus Distichium

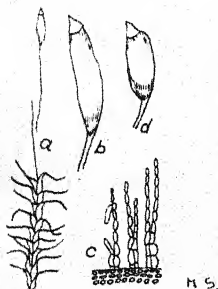


Figure 67

Fig. 67. Distichium capillaceum (Hedw.) Bry. Eur. a, plant; b, capsule; c, peristome; d, capsule of D. inclinatum (Hedw.) Bry. Eur. — In silky tufts in cool rocky places, from Greenland and Alaska to New York, Iowa, Colorado and Calif., often abundant. The two-ranked leaves with broad clasping base and filiform blades are enough to identify the genus.

- 49b Leaves in more than two ranks, all around the stem. .... 50

- 50a Neck of capsule as long as urn or longer.

- Fig. 68. .... Genus Trematodon

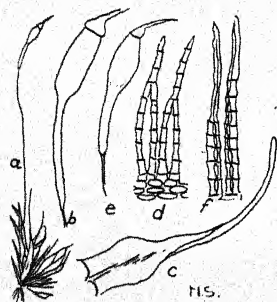


Figure 68

Fig. 68. Trematodon longicollis Mx. a, plant; b, capsule; c, leaf; d, peristome; e, capsule, and f, peristome of T. ambiguus (Hedw.) Hornsch. — Leaves curl when dry, with a broad clasping base; in old fields and meadows, the first from Nfd. to Alaska and Fla., the second from Mass. to Fla. and Mex. Not common.

# HOW TO KNOW THE MOSSES

50b Neck of capsule lacking or nearly so. ....51

51a Leaf cells with very wavy, thick walls.

Fig. 69. ....Genus Racomitrium .....52

51b Leaf cells not, or but little, wavy. ....54

52a Leaves with a densely papillose hair at tip. Fig. 69. ...R. lanuginosum

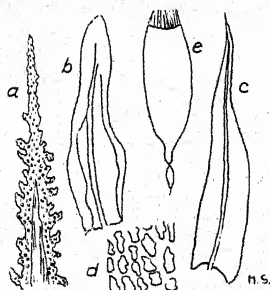


Figure 69

Fig. 69. Racomitrium lanuginosum (Hedw.) Brid. a, apex of leaf; b, leaf of R. aciculare Brid.; c, leaf of R. heterostichum (Hedw.) Brid.; d, cells of lower part of leaf, and e, capsule, of the last. — Common on rocks north and northwest. Seven other species occur in North America. R. heterostichum is extremely variable.

52b Hair points smooth or absent. ....53

53a Leaves rounded and toothed at apex. Fig. 69. ....R. aciculare

53b Leaves tapering to a point, entire, Fig. 69. ....R. heterostichum

54a Leaves very slender, much curled when dry.

Fig. 70. ....Genus Dicranoweisia

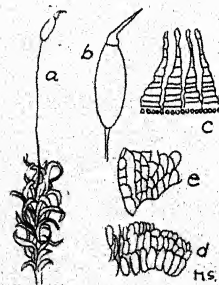


Figure 70

Fig. 70. Dicranoweisia cirrhata (Hedw.) Lindb. a, plant, dry; b, capsule; c, peristome; d, alar cells; e, alar cells of D. crispula (Hedw.) Lindb. — Small mosses in dense sods, to 1 or 2 cm. tall, common from Alaska to Calif. and Ariz., extremely rare eastward.

54b Leaves broader, nearly straight when dry. ....55

# HOW TO KNOW THE MOSSES

## 55a Leaves bearing rhizoids at base. Fig. 71. .... Genus Scouleria

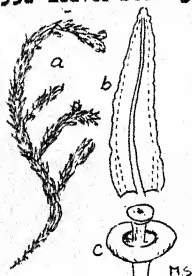


Figure 71

Fig. 71. Scouleria aquatica Hook. a, plant; b, leaf; c, capsule. — Large mosses on rocks in streams, Alaska to Wyo. and Calif. S. marginata E. G. B. has the leaves 2 cells thick along the margins; it has no peristome at all; but the peristome of S. aquatica often falls off with the operculum. Stems to 15 cm. long, more or less branched, with large stiff leaves.

## 55b Leaves without rhizoids. .... 56

### 56a Leaf cells very small, very thick walled, nearly black.

Figs. 72, 73. .... Genus Grimmia. .... 57

### 56b Leaf cells distinct, cubical, less thick, green.

Fig. 78. .... Genus Didymodon No. 67a

## 57a Midrib prominently convex on lower side of leaf. .... 58

## 57b Midrib scarcely visible on under side of leaf; apex of leaf with a long colorless hair. Fig. 72. .... G. laevigata

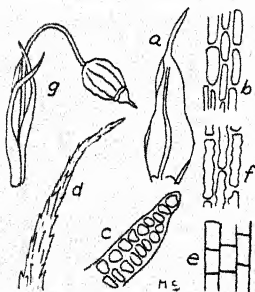


Figure 72

Fig. 72. Grimmia laevigata (Brid.) Brid. a, leaf; b, cells of lower part of leaf; c, cross section of leaf; d, hair point, and e, basal cells of G. pulvinata (Hedw.) Smith; f, basal cells, and g, sporophyte of G. trichophylla Grev. — 48 species of Grimmia are recorded for North America.

## 58a Capsule covered by perichaetial leaves; columella falling out attached to operculum; leaves with or without hair-point.

Fig. 73. .... G. apocarpa

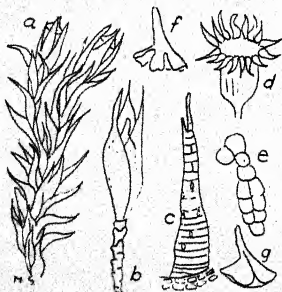


Figure 73

Fig. 73. Grimmia apocarpa Hedw. a, plant; b, sporophyte; c, tooth of peristome; d, peristome; e, cross section of margin of leaf; f, calyptra; g, calyptra of G. alpicola Hedw. — Very common tufted black moss on rocks. The tufts readily break into separate stems. G. apocarpa is the commonest *Grimmia* in the eastern U. S. The midrib projects as a ridge along the back of the leaf. Peristome red, ripe in April.



# HOW TO KNOW THE MOSSES

- 58b Capsule on a curved seta longer than the leaves; columella remaining in the open capsule; leaves ending in a white hair. .... 59
- 59a Basal cells of leaf thin walled, nearly cubical.  
Fig. 72. .... G. pulvinata
- 59b Basal cells of leaf thick walled, distinctly elongate.  
Fig. 72. .... G. trichophylla
- 60a Peristome lacking; leaves costate. Fig. 74... Genus Gymnostomum ... 61
- 60b Peristome lacking; leaves ecostate; capsules immersed.  
Fig. 52 ..... Genus Hedwigia ..... No. 31b
- 60c Peristome present ..... 62
- 61a Capsule smooth and shining, chestnut brown or darker.  
Fig. 74. .... G. recurvirostrum

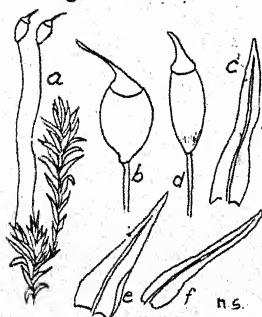


Figure 74

Fig. 74. Gymnostomum recurvirostrum Hedw. a, plant; b, capsule; c, leaf; d, capsule, and e, leaf of G. aeruginosum Smith; f, leaf of G. calcareum Nees & Hornsch. — Gymnostomum forms grey-green tufts or sods on shaded limestone rocks, across the northern half of the continent. G. calcareum is the smallest, 1-10 mm. tall. The operculum of G. recurvirostrum remains attached to the columella long after it loosens from the urn.

- 61b Capsule thin walled, light brown; stems 1-3 cm. tall.  
Fig. 74. .... G. aeruginosum
- 62a (b, c) Teeth entire, solid, perforate or ragged. Figs. 75-78. .... 63
- 62b Teeth neatly cleft in two, half way down. Fig. 619 ..... 68
- 62c Teeth divided to the base into two slender threads. Figs. 79-84. ... 69
- 63a Leaves rolled inward (upward) along the margin.  
Fig. 75. .... Genus Weisia



Figure 75

Fig. 75. Weisia viridula Hedw. a, plant; b, leaf; c, capsule and peristome; d, cross-section of leaf, dry. — In dense tufts among grasses or weeds, about 1 cm. tall, common and widely distributed. Without sporophytes this cannot be distinguished from Astomum. Six other species are reported for North America.



# HOW TO KNOW THE MOSSES

63b Leaf margin plane, or rolled backward (downward). . . . . 64

64a Leaf margin sharply toothed. Fig. 76. . . . . Genus Syrhodon

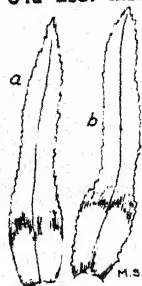


Figure 76

Fig. 76. Syrhodon floridanus Sull. — a, leaf; b, leaf of S. texanus Sull. — Frequent in the Gulf States, and rarely north to Long Island.

64b Leaf margin entire, or toothed only at apex. . . . . 65

65a Peristome teeth whitish, very irregular, rod-like and papillose.

Fig. 77. . . . . Genus Desmatodon . . . . . 66

65b Peristome teeth red or brown, not rod-like. . . . . 67

66a Upper leaves hair-pointed by the excurrent midrib.

Fig. 77. . . . . D. latifolius

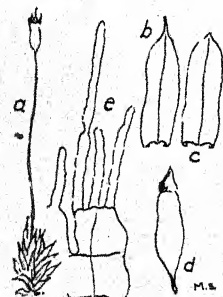


Figure 77

Fig. 77. Desmatodon latifolius (Hedw.) Brid. a, plant; b, leaf; c, leaf, d, capsule, and e, peristome of D. obtusifolius (Schw.) Jur. — Small tufted mosses, mostly on calcareous rocks, the former common in Rocky Mts., the latter in Mississippi Valley States. Twelve other species are reported for North America.

66b Without hair point, but with a distinct abrupt tip on the leaf.

Fig. 77. . . . . D. obtusifolius

67a Leaves green, reddish when old. Fig. 78. . . . . Didymodon recurvirostris

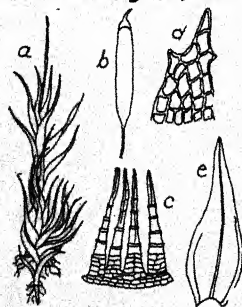


Figure 78

Fig. 78. Didymodon recurvirostris (Hedw.) Jenn. a, plant; b, capsule; c, peristome; d, tip of leaf; e, leaf of D. trifarius (Hedw.) Brid. — D. recurvirostris is common northward, on limestone rocks. D. trifarius has no papillae on the leaves; in the absence of capsules it has been mistaken for Ceratodon; range as above.

# HOW TO KNOW THE MOSSES

- 67b Leaf cells with straight walls, or a few longer cells with wavy walls.  
 Fig. 73. .... Grimmia apocarpa gracilis (Schl.) W. & M.
- 68a Capsule erect, smooth; thin curly sheets on trees. Dicranum montanum
- 68b Capsule inclined, strumose. Fig. 55. .... Oncophorus polycarpus
- 69a Threadlike teeth straight, tapering to a point, nodose; leaf cells all with thick, very wavy walls. Fig. 79. .... Rhacomitrium canescens

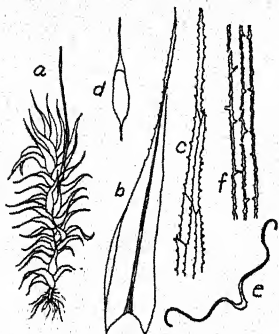


Figure 79

Fig. 79. Rhacomitrium canescens Brid. a, shoot; b, leaf; c, apex of leaf; d, capsule; e, section of leaf; f, median cells. — Stems 2-10 cm. long, erect or spreading, in loose grayish tufts among rocks and stones above timber line, Greenland to Alaska, Calif., Mont. and N. H., Europe, Asia, Africa. Easily recognized by the large papillae on every cell, from base to apex of the leaf. The thick wavy cell walls characterize the genus.

- 69b Threadlike teeth spirally twisted. Figs. 80-84. ....70
- 70a (b, c) Leaves with filamentous growths on upper side of midrib.  
 Fig. 80. .... Genus Aloina

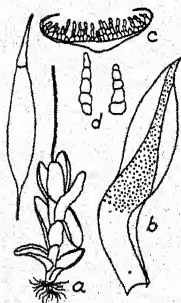


Figure 80

Fig. 80. Aloina rigida (Schultz) Kindb. a, plant; b, leaf with filaments; c, cross section of leaf; d, filaments. — On dry clayey banks, s. w. Iowa to Calif. Stem about 0.5 mm. Only once collected in Iowa, at Council Bluffs. Did it come from the West by rail?

- 70b Leaves tapering from base to tip, without filaments. ....71
- 70c Leaves widest above the middle, without filaments; teeth of peristome from a basal tubular membrane. Fig. 81. .... Genus Tortula ....72
- 71a Basal cells colorless, extending up along margins of leaf.  
 Fig. 82. .... Genus Tortella ....73
- 71b Basal cells not extending up along margins of leaves.  
 Figs. 83, 84. .... Genus Barbula ....74

# HOW TO KNOW THE MOSSES

72a Peristome with very short tube, scarcely to be detected; plant 5-15 mm. tall. Fig. 81. .... T. muralis

72b Peristome with basal tube half as long as the teeth; plant 2-10 cm. tall. Fig. 81. .... T. ruralis

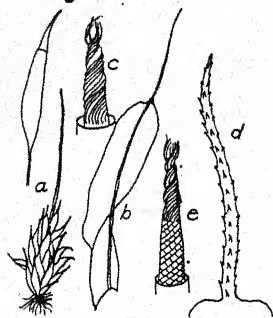


Figure 81

Fig. 81. Tortula muralis Hedw. a, plant; b, leaf; c, peristome. On stones and walls, northward. T. Bolanderi (Lesq.) Broth. of Calif. is similar. — Tortula ruralis (Hedw.) Smith. d, apex of leaf; e, peristome. Common northward on dry rocks and soil. On the west coast T. princeps DeNot. resembles this, but has a tuft of antheridia just below the seta. Twenty other Tortulas are known in North America.

73a Leaves abruptly narrowed to the tip. Fig. 82. .... T. humilis

73b Leaves long-tapering from the base to a slender apex.

Fig. 82. .... T. tortuosa

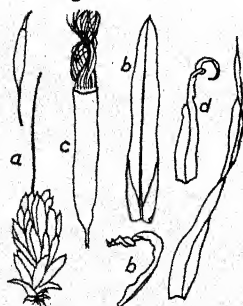


Figure 82

Fig. 82. Tortella humilis (Hedw.) Jenn. a, plant; b, leaf, dry, and spread out; c, capsule and peristome. Common in the southeast, on ground, rocks or bases of trees. — Tortella tortuosa (Turn.) Limpr. d, leaf dry, and spread out. — T. fragilis (Hook. & Wils.) Limpr. resembles T. tortuosa, but has the tips broken off of most of the leaves. The broken pieces are able to start new plants.

74a Leaves tongue-shaped, with short, abrupt point.

Fig. 83. .... B. unguiculata

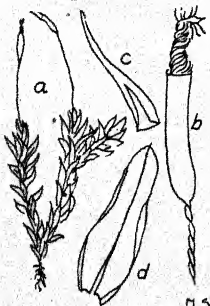


Figure 83

Fig. 83. Barbula unguiculata Hedw. a, plant; b, capsule and peristome; c, calyptra; d, leaf. Very common in eastern half of U. S., on rocks or newly-exposed soil. B. convoluta Hedw. is similar, but the inner perichaetial leaves are wrapped around the seta. N. S. to Fla.; B. C. to Mex. Europe.

## HOW TO KNOW THE MOSSES

- 74b Leaves evenly tapering from near base to apex; cells of upper surface of midrib elongate. Fig. 84. .... B. fallax

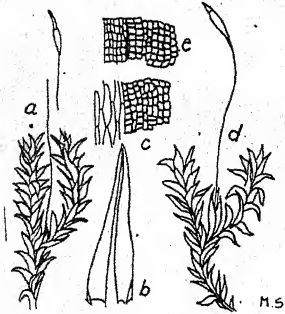


Figure 84

Fig. 84. Barbula fallax Hedw. a, plant in wet condition; b, leaf; c, cells of midrib and lamina; d, plant of B. vinealis; e, cells of midrib and lamina. Common on moist banks, northeast. On the west coast B. vinealis Brid. resembles B. fallax, but has small square cells over the midrib. Fifteen other valid species are recognized in North America by conservative bryologists.

### DIPLOLEPIDEAE

- 75a Sporophyte borne at tip of a leafy shoot; if lateral, the perichaetial leaves are not different from other leaves.  
Figs. 85-111. .... Acrocarpi .....76
- 75b Sporophyte borne on a very short branch, beset with perichaetial leaves that are very different from the ordinary.  
Figs. 112-232. .... Pleurocarpi .....119

### ACROCARPI

- 76a (b, c) Without peristome, Fig. 86. .... Genus Physcomitrium ....77
- 76b With a single peristome, teeth blunt, short, membranous; plant blackish, creeping on bark of trees; leaf cells minute, thick-walled.  
Fig. 85. .... Genus Drummondia

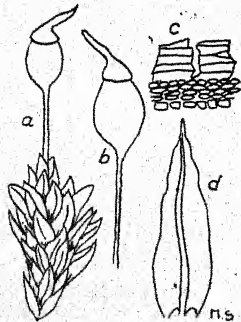


Figure 85

Fig. 85. Drummondia prorepens (Hedw.) Jenn. a, plant; b, capsule and seta; c, peristome; d, leaf. — Common in southeastern states, rare northward to Vt. and Iowa. Forms broad mats, closely attached to bark, and freely fruiting. On sugar maple in Vt. and Iowa, six to eight feet above the ground.

- 76c With peristome distinctly double (in two circles). ....79

## HOW TO KNOW THE MOSSES

77a Without seta; capsule flat topped. Fig. 86. .... P. immersum

77b Seta longer than leaves. Fig. 86. .... 78

78a Flattened cells around mouth of capsule in 7-11 rows; annulus separating in fragments. Fig. 86. .... P. turbinatum

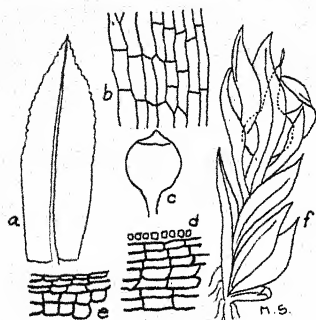


Figure 86

Fig. 86. Physcomitrium turbinatum (Mx.) Brid. a, leaf; b, cells of leaf; c, capsule; d, mouth of capsule. A very abundant moss in eastern U. S., in gardens, lawns, pastures, and open woods. May. — P. Hookeri Hamp. e, mouth of capsule. — P. immersum Sull. f, plant. P. immersum grows with Aphanorhegma serratum on muddy banks of rivers. Capsules of Aphanorhegma are spherical when dry. Those of P. immersum have a distinctly flattened, beaked operculum. October.

78b Flattened cells around mouth of capsule in 3-5 rows; annulus large, rolling back when capsule opens. Fig. 86. .... P. Hookeri

79a Segments directly in front of teeth (not alternating). Figs. 87, 88. .... Genus Funaria .... 80

79b Segments alternating with teeth, or divided into many slender bars. Figs. 89-232. .... 81

80a Mouth of capsule with a large deciduous annulus. Fig. 87. .... F. hygrometrica

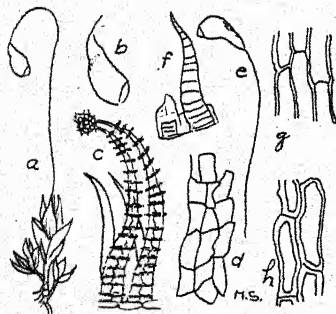


Figure 87

Fig. 87. Funaria hygrometrica Hedw. Cord Moss. a, plant; b, capsule; c, peristome; d, cells of leaf. — One of the commonest and most cosmopolitan mosses, preferring lime, lime-stone or ashes. The curved and twisted seta un-curves and untwists when moistened. — F. calvoscens Schw., e, has an erect seta with the capsule inclined; common southward and into South America. F. h. var. convoluta Hampe. is the usual form on the Pacific Slope. F. flavicans Mx., f, has the segments short and truncate; g, cells of capsule of F. h. convoluta from a furrow; h, from a ridge.



## HOW TO KNOW THE MOSSES

80b Mouth of capsule without annulus. Fig. 88. .... F. americana

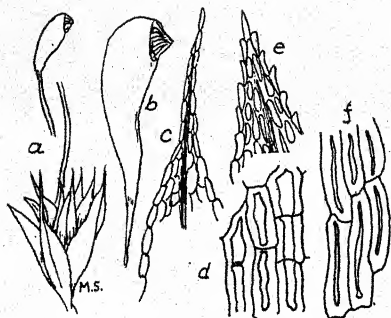


Figure 88

Fig. 88. Funaria americana Lindb. a, plant, b, capsule; c, apex of leaf and margin; d, upper cells of capsule of F. serrata in a furrow; e, apex and margin of leaf of same; f, upper cells of capsule on a ridge. — The first is found from Penna. to Minn., Tex. and Ga. The second, Ga. to Tex. Three other exannulate species are occasionally found. The peristomes of these are similar to that of F. hygrometrica. The narrow cells of the capsule in this group, with enormously thickened walls, d and f, contrast with the much thinner walled cells of the annulate Funarias, Fig. 87, g and h.

81a (b, c) Inner peristome consists of 8 or 16 slender thread-like rods alternating with the teeth.

Figs. 90-94. .... Family Orthotrichaceae ..... 82

81b Inner peristome divided to the middle into many prickly threads.

Fig. 89. .... Genus Timmia

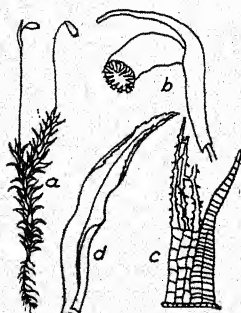


Figure 89

Fig. 89. Timmia megapolitana Hedw. a, plant; b, capsule and calyptra; c, peristome; d, leaf. — Two to four inches tall, often in dense clumps. T. austriaca Hedw., of the far north and Rocky Mts., has the sheathing base of the leaf orange-yellow, and cilia of the inner peristome not prickly. Out of doors Timmia is easily recognized by the calyptra standing erect at the bend of the seta.

81c Inner peristome membranous below, divided above into 16 segments which are more or less perforated, with 1-3 (or 0) slender threads (cilia) between the segments. Figs. 95-111. .... 91



## HOW TO KNOW THE MOSSES

- 82a Stomata superficial, on neck of capsule; basal marginal cells of leaf short and colorless; leaves usually curly when dry.

Fig. 90. .... Genus Ulota ..... 83

- 82b Stomata on urn; cells not as above; leaves usually not curly.

Figs. 91-94. .... Genus Orthotrichum ..... 85

- 83a Leaves not curly; seta as long as leaves or longer; on non-calcareous rocks. Fig. 90. .... U. americana

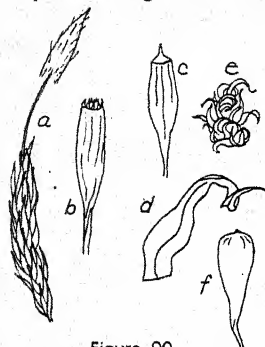


Figure 90

Fig. 90. Ulota americana (Beauv.) Limpr. a, plant; b, capsule. — Ulota crispa (Hedw.) Brid. c, mature capsule; d, dry leaf; e, a dry shoot. — Ulota Ludwigii Brid. f, capsule. — Eight other species are listed for North America. Rev. W. R. Megaw of Belfast, Ireland, has written a novel entitled "Ulot"; it tells of the loves, human and vegetal, of a bryologist.

- 83b Leaves curly when dry; seta nearly as long as leaves, or longer; on trees. .... 84

- 84a Capsule contracted below the mouth when dry and empty; 8-ribbed.

Fig. 90. .... U. crispa

- 84b Capsule club-shaped, light brown, smooth above, ribbed on the neck.

Fig. 90. .... U. Ludwigii

- 85a Growing on rocks ..... 86

- 85b Growing on trees ..... 88

- 86a Stomata superficial. Fig. 91. .... O. rupestre

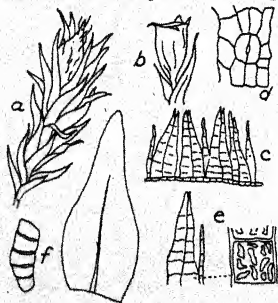


Figure 91

Fig. 91. Orthotrichum rupestre Schl. a, plant; b, capsule and seta; c, peristome; d, stomata; e, peristome of O. texanum Sull.; f, leaf and gemma of O. obtusifolium Brid. — Across Canada and south to Texas in the Rocky Mt. region. O. obtusifolium grows on trees, the other two on rocks.

# HOW TO KNOW THE MOSSES

- 86b Stomata immersed. Fig. 92c. .... 87
- 87a Seta longer than leaves. Fig. 92. .... O. anomalum
- 87b Seta shorter than leaves. Fig. 92. .... O. strangulatum

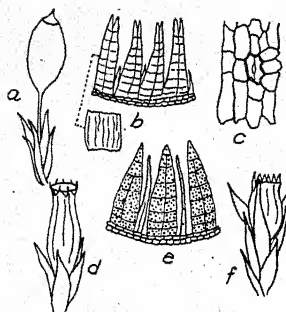


Figure 92

Fig. 92. Orthotrichum anomalum Hedw. a, capsule and seta; b, peristome; c, stoma; d, capsule and seta, and e, peristome of O. strangulatum Schw. f, capsule and seta of O. cupulatum (Hoffm.) Brid. — The first is common northeast and across the continent, the second is common in the central states (eastern Iowa), the third is rare, in the northwest. Easily confused with Grimmia unless capsules are present.

- 88a Leaves blunt and rounded at apex, usually with gemmae. Fig. 91. .... O. obtusifolium
- 88b Leaves more or less acute. .... 89
- 89a Stomata superficial. Figs. 91, 93. .... O. Lyellii

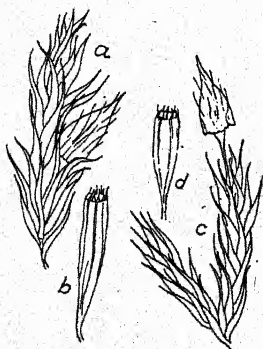


Figure 93

Fig. 93. Orthotrichum Lyellii Hook. & Tayl. a, plant; b, capsule and seta; c, plant, and d, capsule and seta of O. speciosum Nees. — Rocky Mts. and western; our largest species. O. speciosum has an antheridial bud just below the sporophyte; the other species is dioicous, and has strongly papillose leaves. These big branching species are from two to six cm. tall.

- 89b Stomata immersed. Figs. 92, 94. .... 90
- 90a Some leaves with a colorless cell at tip with 1-3 papillae; peristome teeth papillose all over. Fig. 94. .... O. pumilum

## HOW TO KNOW THE MOSSES

- 90b Leaves all more or less obtuse; capsules straw-colored, only slightly contracted under mouth when dry. Fig. 94. .... O. ohioense

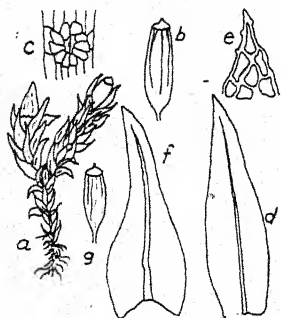


Figure 94

Fig. 94. Orthotrichum pumilum Dicks. a, plant; b, capsule; c, stoma; d, leaf; e, apex of leaf; f, leaf, and g, capsule of O. ohioense Sull. & Lesq. — O. pumilum is abundant in the central Mississippi Valley (Iowa); O. ohioense is common from Canada to Florida, from Ohio eastward. The plants occur in tufts, often in deep crevices of bark; best fruited in June and July.

- 91a Leaves distinctly papillose .....92

- 91b Leaf cells smooth, not papillose .....98

- 92a Capsules curved, ribbed lengthways, 2 or 3 times as long as thick.

- Fig. 95. ....Genus Aulacomnium .....93

- 92b Capsules nearly spherical, more or less ribbed.

- Figs. 96-99. ....Family Bartramiaceae .....94

- 93a Leaves broadly oval, rounded and toothed at apex.

- Fig. 95. .... A. heterostichum

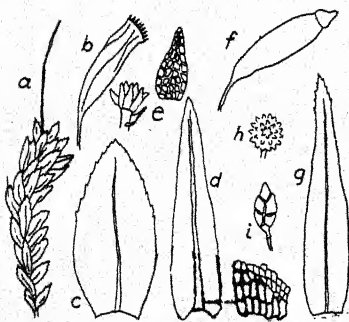


Figure 95

Fig. 95. Aulacomnium heterostichum (Hedw.) Bry. Eur. a, plant; b, capsule; c, leaf; d, leaf of A. palustre with swollen basal cells; e, cluster of gemmae and single gemma of same; f, capsule; g, leaf; h, gemma-head; i, gemma of A. androgynum Schw. This last species lacks the swollen cells at base of leaf. It is common on the west coast; the other two are common east of the grassland states.

- 93b Leaves wedge-shaped, tapering to tip. Fig. 95. .... A. palustre

# HOW TO KNOW THE MOSSES

94a Leaves linear, very narrow.

Fig. 96. .... Genus Bartramia .....95

94b Leaves lanceolate or broader. Figs. 97,98. ....96

95a Leaves 4-7 mm. long, curly when dry. Fig. 96. ....B. pomiformis

95b Leaves 4-5 mm. long, not curly, with a broad, clasping base.

Fig. 96. ....B. ithyphylla

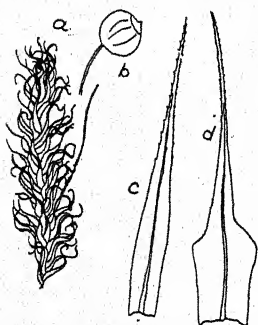


Figure 96

Fig. 96. Bartramia pomiformis Hedw. a, plant; b, capsule; c, leaf; d, leaf of B. ithyphylla Brid. — B. pomiformis, the Apple Moss, from the shape of the capsules, makes sods and cushions many feet across and 2 to 4 inches deep, in rocky woods, from Iowa to the Atlantic, often associated with Aulacomnium heterostichum. The other species is found from Labrador to Alaska, and southward in the mountains to Penna. and Ariz.

96a Leaves closely appressed; stems densely reddish-tomentose, stout and coarse; capsules erect. Fig. 97. ....Anacolia

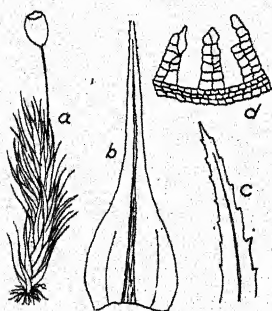


Figure 97

Fig. 97. Anacolia Menziesii (Turn.) Paris. a, plant; b, leaf; c, apex of leaf; d, peristome. — In rock-crevices, Calif. to Alaska.

96b Leaves appressed, or spreading at tip; stems often tomentose below; capsules strongly inclined to nodding.

Fig. 98. .... Genus Philonotis .....97

## HOW TO KNOW THE MOSSES

97a Leaf cells papillose at the upper ends. Fig. 98. .... P. longiseta

97b Leaf cells papillose at the lower ends. Fig. 98. .... P. fontana

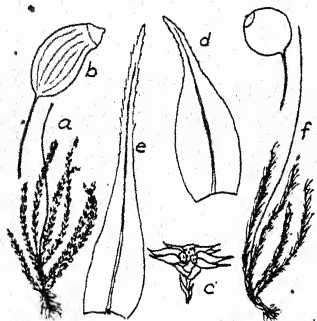


Figure 98

Fig. 98. Philonotis fontana (Hedw.) Brid. a, plant; b, capsule; c, antheridial head; d, leaf; e, leaf, and f, plant, of P. longiseta. — The Fountain moss is common about fresh-flowing springs and seeps across the continent, often forming sods 2 or 3 inches deep bound together by rhizoids; extremely variable. P. longiseta (Rich.) E. G. B. has the antheridia in a small lateral cluster. Eight other species are known in North America.

98a Capsules ribbed and furrowed when dry ..... 99

98b Capsules smooth when dry ..... 100

99a Capsules globular, nearly erect; leaves long and narrow.

Fig. 99. .... Plagiopus Oederi

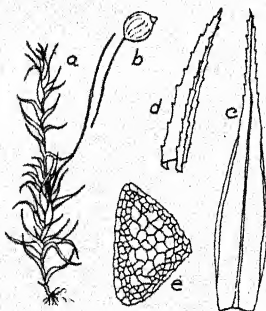


Figure 99

Fig. 99. Plagiopus Oederi (Brid.) Limpr. a, shoot; b, capsule; c, leaf; d, apex of leaf; e, section of stem. — In dense, often hemispheric tufts, 3-9 cm. tall; stem 3-angled, the outer cells thin walled; leaf margins widely recurved, toothed on margin and on recurved portion, otherwise not papillose. Leaves 3 to 4 or 5 mm. long. Synoicous. In shaded calcareous ravines, on earth or rocks, Labr. to Alaska, Wash., Col., Ill. and Penna. Europe.

99b Capsules elongate, inclined, contracted under the mouth; leaves broadly ovate. Fig. 95. .... Aulacomnium heterostichum

100a Capsules pear-shaped, narrower at neck than at mouth, more or less nodding. Figs. 100-107. .... 101

100b Capsules barrel-shaped, widest at the middle. Figs. 108-111. .... Genus Mnium ..... 113

## HOW TO KNOW THE MOSSES

- 101a** Leaves almost filiform, above a broader base; capsule with much narrowed, wrinkled neck. Fig. 100. .... Genus Leptobryum

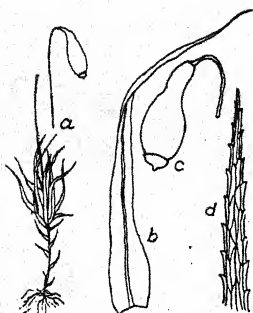


Figure 100

Fig. 100. Leptobryum pyriforme (Hedw.) Schimp. a, plant; b, leaf; c, capsule; d, apex of leaf. — Everywhere, especially on newly disturbed soil. The brown, semi-transparent capsules are unmistakable. Up to 10,000 ft. in Colorado. Spitzbergen to the Alps and Caucasus, Asia, New Zealand, Patagonia to Brazil and Ecuador.

- 101b** Leaves broader, lanceolate to ovate; neck not so contracted. ....102

- 102a** Leaves to 5 mm. long, bordered by narrow cells in a dense terminal rosette, on a scaly stem. Fig. 101. .... Genus Rhodobryum

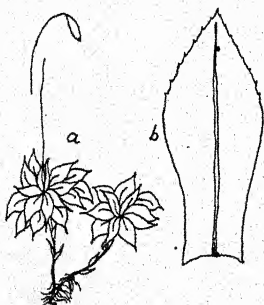


Figure 101

Fig. 101. Rhodobryum roseum (Schimp.) Hampe. a, plant; b, leaf. — In woods, often in broad patches. Widespread in North America, Europe and Asia.

- 102b** Leaves smaller, not densely clustered. ....103

- 103a** Cells of leaf hexagonal to 4-sided.  
Figs. 102-105. .... Genus Bryum ....104

- 103b** Cells of leaf elongate, 4-12:1.  
Figs. 106, 107. .... Genus Pohlia ....110



# HOW TO KNOW THE MOSSES

- 104a Leaves small, broad, colorless or nearly so, closely packed on slender, cylindric shoots; seta to 1 cm. tall. Fig. 102. .... B. argenteum

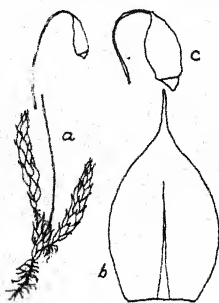


Figure 102

Fig. 102. Bryum argenteum (L.) Hedw. a, plant; b, leaf; c, capsule. — Common on earth, walls, stones, ashes, sidewalks, but not always fruiting; throughout the whole world. Forming sods of tiny silvery shoots; unmistakable.

- 104b Leaves larger, looser, green. .... 105

- 105a Capsule distinctly curved. Fig. 103. .... B. uliginosum

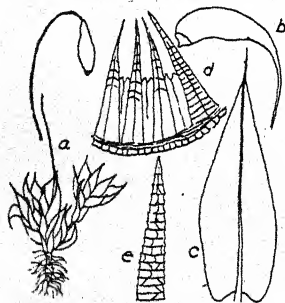


Figure 103

Fig. 103. Bryum uliginosum (Brid.) Bry. Eur. a, plant; b, capsule; c, leaf; d, peristome; e, tooth of B. pendulum (Hornsch.) Schimp. — The absence of cilia from the inner peristome, and the large, curved capsules, characterize this moss; it is autoicous. In damp places, mostly exposed, around the northern parts of the globe. — B. inclinatum (W. & M.) Sturm is similar, but the capsule is straight and symmetrical, though nodding.

- 105b Capsule symmetrical .... 106

- 106a Peristome teeth with irregular cross-connections, giving the effect of bubbles between the transverse bars; cilia lacking; inner peristome firmly fastened to outer. Fig. 103. .... B. pendulum

- 106b Peristome without cross-connections; inner and outer peristomes separate from one another. .... 107

- 107a Cells of leaf blade large and broad for the genus; midrib typically ending below apex of leaf; leaves often spirally twisted when dry.

Fig. 104, e. .... B. capillare

- 107b Cells of leaf blade smaller, narrower, thick-walled. .... 108

- 108a Midrib little or not at all excurrent. Fig. 105. .... 109

## HOW TO KNOW THE MOSSES

**108b Midrib of upper leaves excurrent as a long awn.**

**Fig. 104.** ..... **B. caespiticium**

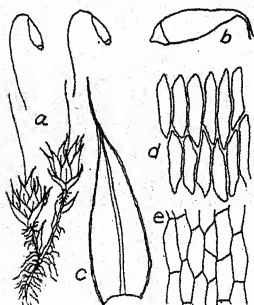


Figure 104

Fig. 104. **Bryum caespiticium** (L.) Hedw. a, plant; b, capsule; c, leaf; d, cells of leaf; e, leaf cells of **B. capillare** Hedw. — **B. caespiticium** is the commonest typical **Bryum** in the U. S., growing on earth, stones, walls, paths; it is dioicous. **B. cuspidatum** is very similar, but is synoicous. Typical **B. capillare** leaves resemble a **Mnium**, with large open cells; others are much like **B. caespiticium**.

**109a Leaves loose and crinkled when dry; capsule brown.**

**Fig. 105.** ..... **B. pseudotriquetrum**

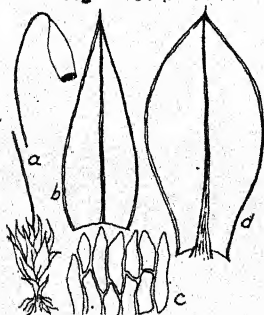


Figure 105

Fig. 105. **Bryum pseudotriquetrum**. a, plant; b, leaf; c, cells of leaf; d, leaf of **B. crassirameum** R. & C. Also known as **B. bimum** Schreb. Common in water and wet places, the stems bound together by brown rhizoids. N. America and Europe. **B. crassirameum** is a large form of our west coast.

**109b Leaves large, closely overlapping when dry; capsule red, Fig. 105, a western form of the preceding.** ..... **B. crassirameum**

**110a Plant very pale and watery; leaves toothed; capsules as broad as long.**

**Fig. 106.** ..... **P. Wahlenbergii**

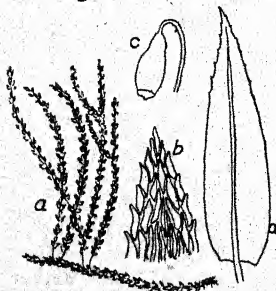


Figure 106

Fig. 106. **Pohlia Wahlenbergii** (W. & M.) Andr. a, plant; b, apex of leaf; c, capsule; d, leaf. — Common in wet places. **P. carnea** (**P. delicatula** (Hedw.)) is similar but smaller with very short capsules; rare, on drier ground. The leaves of this water-loving moss are very slow to take up water after being dried.

**110b Plant grass-green; capsules much longer than thick** ..... 111

## HOW TO KNOW THE MOSSES

111a With abundant gemmae in axils of leaves. Fig. 107. . . . P. annotina

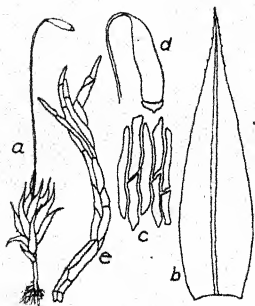


Figure 107

Fig. 107. Pohlia nutans (Hedw.) Lindb. a, plant; b, leaf; c, cells of leaf; d, capsule; e, gemma of P. annotina var. decipiens Loeske. — P. nutans has 2 antheridia at the base of each perichaetial leaf, as have several other Pohlias. Widespread around the northern hemisphere. P. elongata lacks luster; some other species have a metallic luster.

111b Without gemmae. . . . .112

112a Leaves with metallic luster; cells and capsules very long. . . P. cruda

112b Leaves dull, without luster; cells shorter, thick-walled; capsule stouter; very common in woods. Fig. 107. . . . . P. nutans

113a Plant tree-like: stems erect, scaly, with many leafy branches.

Fig. 108. . . . . M. Menziesii

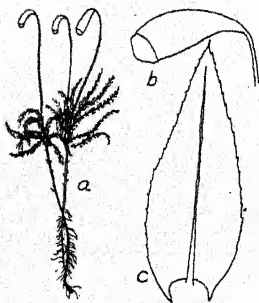


Figure 108

Fig. 108. Mnium Menziesii (Hook.) C.M. a, plant; b, capsule; c, leaf. — Abundant on the Pacific Coast, Calif. to Alaska. A stately and impressive plant, 4 to 8 cm. tall. Stem leaves wide apart, colorless in upper half. Seta as much as 5 cm. tall, with the capsule up to 8 mm. long.

113b Stems little branched, not at all dendroid. . . . .114

114a Leaves without specialized border-cells, toothed above; plants clustered, dull green. Fig. 109. . . . . M. stellare

114b Leaves bordered by long, slender, thick-walled cells.

Figs. 109-111. . . . .115

# HOW TO KNOW THE MOSSES

115a (b, c) Border of leaf very thick and strong, entire.

Fig. 109. .... M. punctatum

115b Border of leaf with a single row of teeth. Fig. 110. ....116

115c Border of leaf with teeth in pairs. Figs. 109, 111. ....118

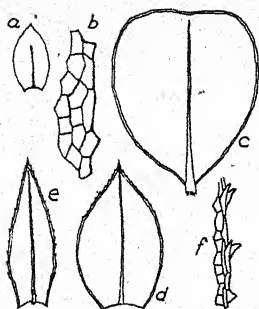


Figure 109

Fig. 109. a, leaf; b, margin of leaf of Mnium stellare Hedw.; c, leaf of M. cuspidatum Hedw.; d, leaf, and f, margin of leaf of M. orthorhynchum Brid. The first two of these are unique. To the latter two several species are similar. Those with single teeth have shoots which arch over and root at the tip, like black raspberry canes.

116a Capsule with distinct neck; leaf cells up to .035 mm. in diameter; all stems erect (no stolons); northwestern. Fig. 110. .... M. venustum

116b Capsule without neck; sterile stems arch over and strike root at tip. Fig. 110. ....117

117a Leaf cells up to .025 mm. in diameter; leaves toothed only along upper half; synoicus. Figs. 109-110 .... M. cuspidatum

117b Leaf cells up to .05 mm. or more; margin toothed nearly to base; dioicous. Fig. 110. .... M. affine

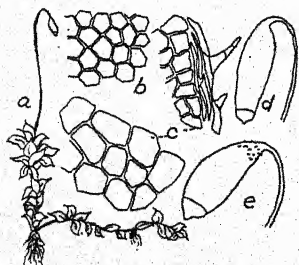


Figure 110

Fig. 110. Mnium cuspidatum Hedw. Very common in central and eastern states. a, plant; b, cells of leaf; c, cells of M. affine Bland. with 3-celled tooth of border; d, capsule of M. affine; e, capsule of M. venustum Mitt. — M. medium Bry. Eur. is large-celled and synoicus; across the continent, northward. M. insigne Mitt. is large-celled, dioicous, many fruited, northwestern.

118a Leaves long and narrow, the midrib not reaching the apex; operculum short, not beaked; leaf cells .02-.025 (.035) mm. in diameter; dioicous .... M. hornum Hedw.

## HOW TO KNOW THE MOSSES

- 118b Leaves broader, the midrib percurrent; operculum beaked; leaf cells .02 mm. in diameter; dioicous. Figs. 109-111. . . . M. orthorhynchum

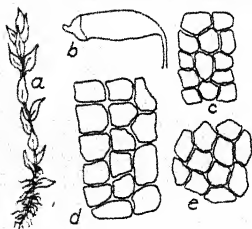


Figure 111

Fig. 111. Mnium orthorhynchum Brid. a, plant; b, capsule and operculum; c, cells of leaf; d, cells of M. serratum Brid.; e, cells of M. spinulosum Bry. Eur. — These three are common in woods northeast and across the continent. M. spinulosum is rarest; the capsule has a red mouth! The latter two are synoicous.

### PLEUROCARPI

- 119a Leaves papillose, at least on the posterior (under) side and on upper half of leaf. Fig. 15. . . . .120
- 119b Leaves not at all papillose. . . . .143
- 120a Papillae consist of projecting angles of the cell wall. Figs. 15, 113 . . . . .121
- 120b Papillae stand out as knobs or points over the cell-cavity. Figs. 15, 118, 120 . . . . .126
- 121a Leaves with single strong midrib, extending beyond middle of leaf. .122
- 121b Leaves with midrib absent, or short and double. . . . .124
- 122a Papillae small, often hard to find; cells short, 4-6:1. margins of leaf plane, serrate. Fig. 113. . . . .Genus Bryhnia . . . . .123
- 122b Papillae strongly directed toward tip of leaf; leaves strongly rugose and all bent to one side of stem (secund). Fig. 112. . . Genus Rhytidium

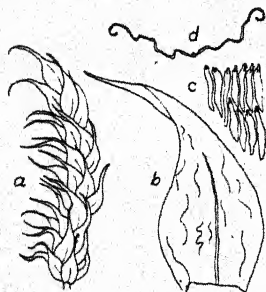


Figure 112

Fig. 112. Rhytidium rugosum (Hedw.) Kindb. a, branch with leaves; b, leaf; c, papillae; d, cross-section of leaf. — A large (to 12 cm.) dull-green moss forming mats on rocks, across the continent, south to N. C., Mo., N. Mex. and Ariz. Reaches 12,500 ft. altitude in Colorado. Margin of leaf narrowly reflexed, finely toothed above; cells 8-10:1.

- 123a Branch leaves distinctly acuminate, lanceolate. Fig. 113. . . . . B. graminicolor



# HOW TO KNOW THE MOSSES

- 123b Branch leaves ovate, abruptly short-acuminate, the tip twisted to the right. Fig. 113. .... B. novae-angliae

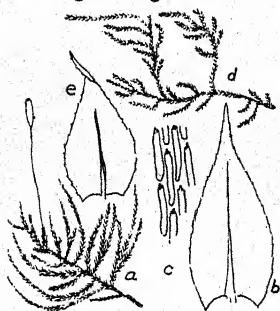


Figure 113

Fig. 113. Bryhnia graminicolor (Brid.) Grout. a, plant; b, leaf; c, cells and papillae; d, plant, and e, leaf of Bryhnia novae-angliae (S. & L.) Grout. — The former creeps on moist earth in thin yellowish green mats; the branches taper to a point. The latter species is of bushy growth, preferring very wet places. Confined to eastern U. S., to Minn. and Mo.

- 124a Paraphyllia abundant; shoots broad and flat by much branching in one plane, a new shoot rising each year from the middle of the older one. Fig. 114. .... Genus Hylocomium

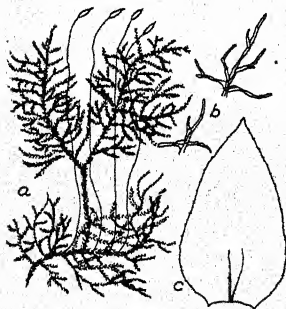


Figure 114

Fig. 114. Hylocomium splendens (Hedw.) Bry. Eur. a, plant; b, paraphyllium; c, leaf. — Often carpeting rocks and soil in deep mats; across the continent, south to N. C. (mts.), Iowa, N. Dak., Colo. and Cal. 3800 ft. in Catskills. A denizen of the spruce-fir forest in Europe and America. One of our most beautiful frondose (fern-like) mosses.

- 124b Paraphyllia lacking. .... 125

- 125a Small creeping matted moss, the leaves broad and cordate at base, suddenly long-acuminate, serrate, strongly falcate, secund; more or less papillose on back above. .... Hypnum molluscum .... see 222

- 125b Large erect and spreading moss, to 15 cm. tall; leaves up to 5 mm. long, cordate-triangular, widely spreading wet or dry; 2 midribs reach to middle of leaf or farther; upper cells spinose-papillose on back. Fig. 115. .... Genus Rhytidiadelphus

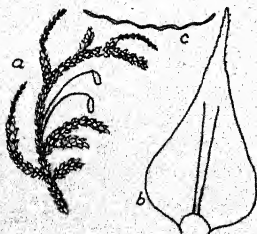


Figure 115

Fig. 115. Rhytidiadelphus triquetrus (Hedw.) Warnst. a, plant; b, leaf; c, cross-section of leaf. — A robust moss, very abundant in places, used for packing crockery. On the ground, across the continent, and in Europe. South to N. C., Mo., and Calif. The broad-based plicate stem leaves are very characteristic.



## HOW TO KNOW THE MOSSES

- 126a With creeping matted rhizomes, on bark; stems erect, nearly leafless; branches densely leafy, becoming curled up when dry; capsule as long as seta. Fig. 116. .... Genus Dendroalsia

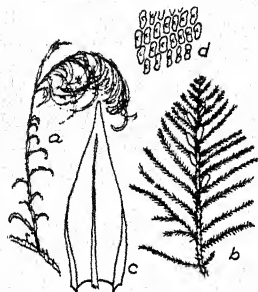


Figure 116

Fig. 116. Dendroalsia abietina (Hook.) E. G. B. a, plant dry; b, branch with capsules; c, leaf; d, cells of leaf. — Calif. to B. C. and Idaho, often abundant. The plant curls up in a characteristic way when dry.

- 126b Plants not dendroid (with trunk and branches), variously creeping and branching. .... 127

- 127a Leaves without midrib; slender, pale green mosses. .... 128

- 127b Leaves with distinct single midribs. .... 129

- 128a Leaves erect-spreading, ovate or narrower, acuminate; serrulate all round; papillae small. Fig. 117. .... Genus Schwetschkeopsis

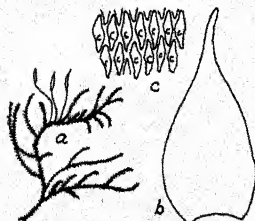


Figure 117

Fig. 117. Schwetschkeopsis denticulara (Sull.) Broth. a, plant; b, leaf; c, cells of leaf. — A tiny pale green moss, on trees or rocks, east of the Mississippi River, from Conn. to the Gulf; frequent southeast. Seta 4-8 mm. long. Each leaf-cell has one papilla on the dorsal surface. It was formerly considered to be a *Leskea*.

- 128b Leaves round-ovate, deeply concave, closely packed wet or dry.

- Fig. 118. .... Genus Myurella

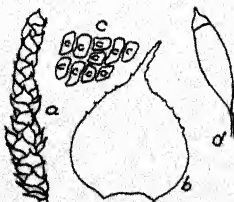


Figure 118

Fig. 118. Myurella Careyana Sull. a, shoot; b, leaf; c, papillae; d, capsule. — *M. julacea* is papillose by projecting angles of the cells; *M. Careyana* has a large papilla over the lumen. Across the continent from Nova Scotia to the Yukon and south to N. C., Tenn., and Iowa. The little cylindrical shoots of *Myurella*, creeping over hard limestone rocks, have a peculiar charm.

## HOW TO KNOW THE MOSSES

- 129a** Leaf cells small, rounded, very thick walled, with narrowly oval or elliptical lumen, with very numerous basal quadrate cells; capsules longer than the seta. Fig. 119. .... Genus Cryphaea

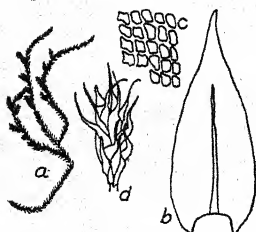


Figure 119

Fig. 119. Cryphaea glomerata Schimp. a, plant; b, leaf; c, cells of leaf; d, branch with capsule. — Leaves closely packed (julaceous) when dry. Inner peristome teeth short, slender and hard to find. Thin mats on trees and shrubs, southeast, north to Conn., west to Tex. C. nervosa (Hook. & Wils.) Bry. Eur. has the midrib ending in or near the apex of the leaf; Gulf States.

- 129b** Cells not shaped and thickened as above, and without the large area of basal quadrate cells; seta longer than capsule, up to 2 or 3 cm. Figs. 120-134. .... Family Leskeaceae .... 130

- 130a** Leaf cells with a single very large papilla, as tall as the diameter of the cell, often forked into 2, 3 or 4; shoots julaceous; leaves nearly circular, deeply concave, Figs. 120, 121. U. S. east of the plains. .... Genus Thelia .... 131

- 130b** Papillae smaller, often several on one cell. .... 132

- 131a** Papillae 3-(2-4)-pointed; marginal cilia of leaf long.

Fig. 120. .... T. asprella



Figure 120

Fig. 120. Thelia asprella Sull. a, shoot; b, papillae; c, margin of leaf; d, capsule; e, margin of leaf of T. Lescurii. — T. asprella makes dense grey-green mats 1 cm. deep on bark of trees, preferably white oak. T. Lescurii Sull. grows on rocks and earth, more common southward. Capsules are in perfect condition in October in s.e. Iowa.

- 131b** Papillae unbranched, curved toward apex of leaf.

Fig. 121. .... T. hirtella

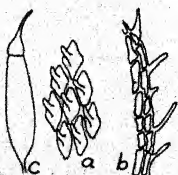


Figure 121

Fig. 121. Thelia hirtella (Hedw.) Sull. a, papillae; b, margin of leaf; c, capsule. — Common southward. The simple papillae distinguish this from the preceding species.

# HOW TO KNOW THE MOSSES

132a (b, c) Paraphyllia absent or few, and scale-like or lanceolate. . . . .133

132b Paraphyllia numerous, linear-lanceolate; cilia poorly developed or absent. Fig. 122. . . . . Genus Pseudoleskea

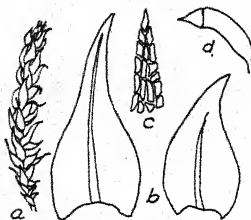


Figure 122

Fig. 122. Pseudoleskea atrovirens Bry. Eur. a, shoot; b, upper and lower leaves; c, apex of leaf; d, capsule. — In loose, dark green colonies, on rocks or bases of trees; Nfd. to B. C., Calif., Idaho, upper Mich. and N. H. Nine other species are known, Rocky Mts. and westward, differing as to shape of leaf cells and capsules, and papillae and paraphyllia; variable and difficult to define.

132c Paraphyllia numerous, filamentous and mostly branched. . . . .139

133a Leaves longly and slenderly acuminate. Figs. 123-125. . . . .134

133b Leaves blunt or acute or broadly acuminate; capsules erect.

Figs. 126-129. . . . .135

134a (b, c) On trees; papillae single, large; leaves entire, apex colorless; capsule erect. Fig. 123. . . . . Genus Lindbergia

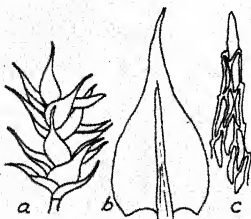


Figure 123

Fig. 123. Lindbergia brachyptera (Mitt.) Kindb. var. Austinii (Sull.) Grout. a, a wet twig; b, leaf; c, apex of leaf. — Scattered shoots or little mats; capsule erect; inner peristome only a low membrane. Quebec to B. C., S. C. and Ariz. Often associated with Leskea. Also found in the Caucasus Mts. of Europe. How come?

134b On rocks and soil, California to Vancouver and Idaho. Leaves serrate; cells with 1 or more large papillae on each face; capsule curved and inclined; cilia of peristome well developed.

Fig. 124. . . . . Genus Claopodium

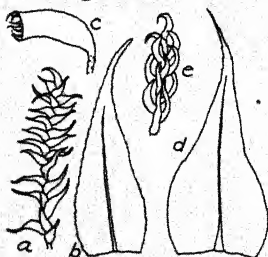


Figure 124

Fig. 124. Claopodium Whippleanum (Sull.) R. & C. a, shoot; b, leaf; c, capsule; d, leaf of C. crispifolium; e, dry twig of same. — With general appearance of Thuidium, which is very scarce on the West Coast. The midrib is colorless and conspicuous.

# HOW TO KNOW THE MOSSES

- 134c Leafy shoots cylindric wet or dry; leaf with slender colorless hairlike apex. Fig. 125. .... Genus Anomodon

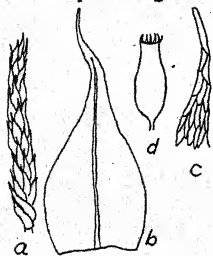


Figure 125

Fig. 125. Anomodon rostratus (Hedw.) Schimp. a, shoot; b, leaf; c, apex of leaf; d, capsule. — Common on rocks, earth or trees, eastern U. S., Canada to the Gulf, Col. and Ariz. Usually in dense mats 1 cm. deep, but often deeper, or at times in a very thin scraggly group. Perfect capsules are collected in October, but peristomes are still good in April.

- 135a Medium to large matted mosses, with leaves clasping the stem at base, more or less complanate above when wet; segments linear, short. Figs. 126, 127. .... Genus Anomodon .... 136

- 135b Small to medium matted mosses on trees, earth or rocks; leaves not clasping, mostly ovate, acute or obtuse, not at all complanate, closely appressed when dry, spreading when wet; segments narrow, keeled and often cleft along the keel.

Figs. 128, 129. .... Genus Leskea .... 137

- 136a Leaves broad and concave at base, becoming tongue-shaped above, rounded at apex. Fig. 126. .... A. minor

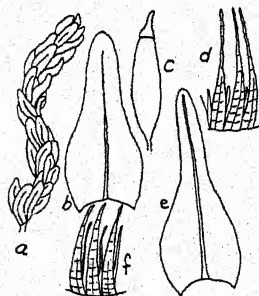


Figure 126

Fig. 126. Anomodon minor (Beauv.) Lindb. a, a leafy shoot; b, detached leaf; c, capsule; d, peristome. — Forming thin mats or scattered shoots on trees, or large (5-10 cm. long) wiry-stemmed clusters on rocks, N. B. to N. Dak., Tex. and Fla. Inner peristome teeth short or lacking. — A. viticulosus (Hedw.) Hook. & Tayl. is similar, mostly on rocks, Canada to Va. The upper half of the leaf is narrower and more tapering than that of A. minor, Fig. 126 e, and the inner peristome, f, is better developed.

- 136b Apex of leaf distinctly apiculate. Fig. 127. .... A. attenuatus

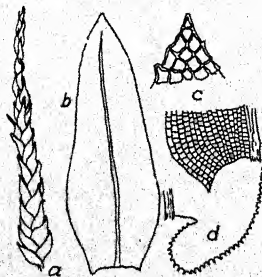


Figure 127

Fig. 127. Anomodon attenuatus (Hedw.) Hueben. a, shoot with flagelliform end; b, leaf; c, apex and base of leaf; d, base of leaf of A. Rugelii. — A. attenuatus is very abundant on rocks in the Mid-west, mostly smaller and on trees in the southeast. Capsules ripen in autumn, but peristomes are still good in April. A. Rugelii is more restricted, N. E. to Mich., and Ga., rare.

137a Median cells of leaves isodiametric, papillose; peristome teeth sharply bent inward at the base when dry. .... 138

137b Median cells longer than wide, oval-hexagonal, smooth or slightly papillose; teeth straight when dry. Fig. 128. .... L. nervosa

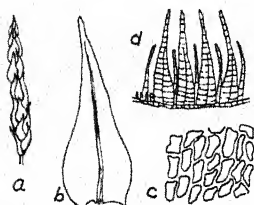


Figure 128

Fig. 128. Leskea nervosa (Schw.) Myrin. a, shoot; b, leaf; c, median cells of leaf; d, peristome. — This species has the midrib reaching almost to the very tip; on trees, stones or rotten wood, Labr. to B. C., Penna. and Col. Dioicous. L. tectorum (A. Braun) Lindb., Yukon to N. Mex., Lake Superior and B. C., has a shorter midrib; margins of leaf entire; cells not over 3:1.

138a Leaves 0.6 mm. long or less; median cells .005-.007 mm. wide; midrib rough below; Fla. to Tex. .... L. australis

138b Leaves 0.7 mm. long or longer; median cells .007-.01 mm. wide; midrib smooth. Fig. 129. .... L. gracilescens

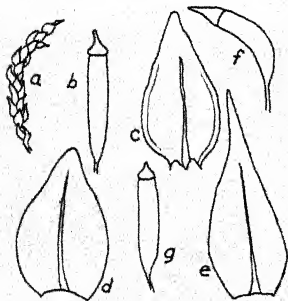


Figure 129

Fig. 129. Leskea gracilescens Hedw. a, shoot; b, capsule; c, leaf; d, leaf of L. obscura Hedw.; e, leaf of L. polycarpa Hedw.; f, capsule of same; g, capsule of L. arenicola. — Small, dark green matted mosses on trees, rocks or earth, widely distributed east of the Rocky Mts. The leaves figured here are "typical". Very many specimens are variously intermediate. If, as Best and Grout advise, intermediates are to be called L. gracilescens, that name will conveniently cover a multitude of forms!

139a Paraphyllia matted together on stem, and present on base of leaf. Fig. 130. .... Genus Helodium

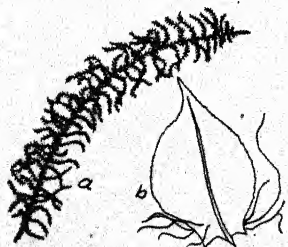


Figure 130

Fig. 130. Helodium paludosum (Sull.) Aust. a, plant; b, leaf with paraphyllia. — Irregularly branching; midrib reaching near to apex of leaf, papillae small. H. Blanfordii (W. & M.) Warnst. is very regularly pinnately branched with shorter midrib and larger papillae. The second inhabits swamps and wet meadows, from N. J., Ill., Iowa and Wash. northward; the first from N. E. to Iowa and N. C.



# HOW TO KNOW THE MOSSES

139b Paraphyllia not attached to leaves.

Figs. 131-134. .... Genus Thuidium .....140

140a Apical cell of branch leaves crowned with 2-4 papillae.

Figs. 132-134. ....141

140b Apical cell of branch leaves with one terminal papilla.

Fig. 131 .....T. virginianum

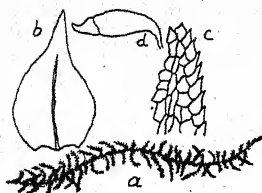


Figure 131

Fig. 131. Thuidium virginianum (Brid.) Lindb. a, plant; b, leaf; c, apical cells of leaf; d, capsule. — In close mats on logs and bases of trees, or on soil, N. E. to Minn. and Mex. — T. microphyllum (Hedw.) Best is similar, with wider range. The dry leaves are smooth; the leaves taper evenly to the apex, "Very abundant in Florida."

141a Paraphyllia numerous and long, branched. Figs. 133, 134. ....142

141b Paraphyllia small, often few, 2-6 cells long; branch leaves curved when dry to make a chain-like effect. Fig. 132. ....T. minutulum

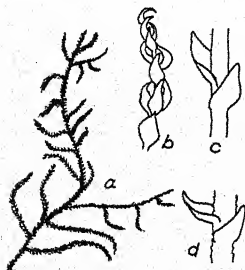


Figure 132

Fig. 132. Thuidium minutulum (Hedw.) Bry. Eur. a, plant; b, dry twig; c, twig. — Thin dark green mats of very fine strands on bases of trees, N. B. to Minn., Mex. and Fla. — T. pygmaeum Bry. Eur. is very similar, growing on limestone in damp, shady places, N. J. to Iowa and Canada. The branches are papillose, Fig. 132d, whereas the branches of the previous one are smooth.

142a Stems closely once-pinnate, cylindrical when dry.

Fig. 133. ....T. abietinum

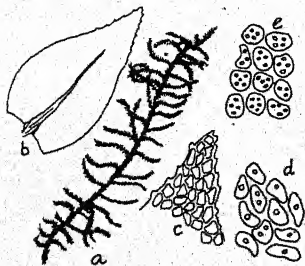


Figure 133

Fig. 133. Thuidium abietinum (Brid.) Bry. Eur. a, plant; b, leaf; c, apical cells of leaf; d, median cells. — A coarse, rigid plant, in mats on rocks or sterile soil, Greenland to Va., Iowa, Col., B. C. and Alaska. — T. scitum (Beauv.) Aust. makes soft thin mats on bases of trees, Ont. to Wis., Mo. and Ga. Each cell has 3-6 small papillae on each surface, Fig. 133e.



## HOW TO KNOW THE MOSSES

142b Stems loosely pinnate, the branches again pinnate or bipinnate.

Fig. 134. .... T. delicatulum



Figure 134

Fig. 134. Thuidium delicatulum (Hedw.) Mitt. a, plant; b, stem-leaf; c, perichaetial leaf; d, capsule; e, stem-leaf of T. recognitum. — In beautiful fern-like mats, often many feet across, in moist shaded places, Labrador to B. C. and the Gulf. — T. recognitum (Hedw.) Lindb. is stiffer and narrower, more yellowish, with short, broad, plicate stem-leaves suddenly contracted to a slender point; perichaetial leaves without cilia. With the same range as the preceding.

143a Paraphyllia numerous and conspicuous. .... 144

143b Paraphyllia few or none, usually not seen. .... 148

144a Plants with creeping rhizomes, erect scaly stems, and a cluster of spreading leafy branches. Fig. 135. .... Genus Climacium

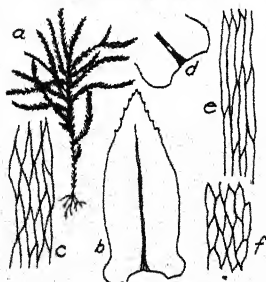


Figure 135

Fig. 135. Climacium americanum Brid. a, plant; b, leaf; c, upper median cells of leaf; d, base of leaf of C. dendroides W. & M.; e, cells of same; f, leaf cells of C. Kindbergii (R. & C.) Grout. — C. dendroides is in Europe and northern North America, to Iowa; C. Kindbergii is in wet places or water, east and southeast; C. americanum is common in woods, east of the Rocky Mts.

144b Without rhizomes or dendroid habit. .... 145

145a (b, c) Complanate-foliate; branches ending in slender flagella; paraphyllia lanceolate, serrulate; capsule longer than seta.

Fig. 230. .... Neckera Menziesii. .... See 241

145b Leaves strongly wrinkled (rugose), all bent toward one side of stem (secund); tips of branches hooked.

Fig. 136. .... Genus Rhytidiopsis

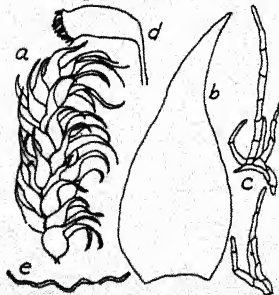


Figure 136

Fig. 136. Rhytidiopsis robusta (Hook.) Broth. a, twig; b, leaf; c, paraphyllia; d, capsule; e, cross-section of leaf. — A big dull-green moss of the northwest, east to Montana.

- 145c Leaves spreading in all directions from stem, not complanate or rugose. ....146  
 146a Midrib single and strong nearly to tip of leaf, or beyond; alar cells large and clear; paraphyllia lanceolate, laciniate.  
 Fig. 137. .... Genus Cratoneuron

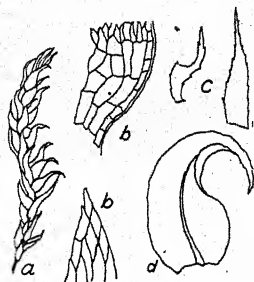


Figure 137

- 146b Midrib single or double, ending much below apex of leaf; paraphyllia branched. ....147  
 147a Upper median leaf cells linear-flexuose; 5-10:1; stems red.  
 Fig. 138. .... Genus Hylocomium

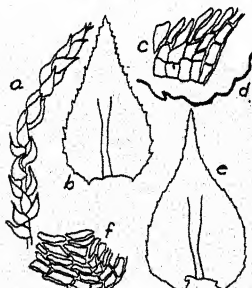


Figure 138

Fig. 137. Cratoneuron filicinum (Hedw.) Roth. a, twig; b, leaf base and apex; c, paraphyllia; d, leaf of C. commutatum (Hedw.) Roth. — Mats in water or very wet places, pinnately branched, now dense, again very loose and irregular; leaves, midribs and paraphyllia very variable. Across the continent, especially northward.

Fig. 138. Hylocomium umbratum (Hedw.) Bry. Eur. a, shoot; b, leaf; c, alar cells; d, cross-section of leaf; e, leaf of H. brevirostre (Beauv.) Bry. Eur.; f, alar region of same. — H. pyrenaicum (Spruce) Lindb. has a single midrib reaching middle of leaf. Big loose patches, to 15 cm. tall, on stones, logs or humus; the first and third from N. E. to Alaska and the mountains of N. C., the second from N. S. to Mo. and Ga. Hylocomium splendens will come here if you missed the papillae on upper back of leaves. See No. 124a, Fig. 114.

- 147b Upper median leaf cells oval-rhombic, 2-3:1, thick-walled, the alar quadrate or transversely elongated. Fig. 139. .... Genus Alsia

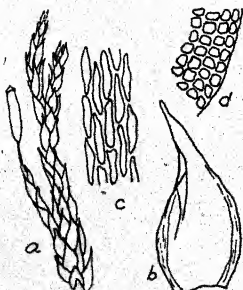


Figure 139

Fig. 139. Alsia californica (H. & A.) Sull. a, twig; b, leaf; c, median cells; d, alar cells. — Midrib very variable; leaves entire; segments much shorter than teeth. Thick loose mats on trees, Calif. to Wash. near the coast.

# HOW TO KNOW THE MOSSES

- 148a Midrib single and strong, reaching to middle of leaf or beyond.  
Figs. 140-182. .... 149
- 148b Midrib lacking, or short and/or double. Figs. 183-232. .... 197
- 149a Aquatic, completely submerged; leaves 2-7 mm. long, stems 10-30 cm.  
long. Figs. 140-146. .... 150
- 149b Terrestrial, on wet or dry substrates, not normally submerged. ... 156
- 150a (b, c) Leaves more or less falcate-secund; stems hooked at tip.  
Figs. 140-143. .... Genus Drepanocladus .... 151
- 150b Leaves complanate (lying in 2 rows).  
..... Leptodictyum riparium forms ..... See 175a
- 150c Leaves appressed, erect or spreading, not falcate or complanate. .. 154
- 151a Terrestrial, often on dry ground; leaves with many longitudinal folds,  
the slender tips bent around in a circle.  
Fig. 140. .... D. uncinatus



Figure 140

Fig. 140. Drepanocladus uncinatus (Hedw.) Warnst. a, plant; b, twig; c, leaf; d, alar cells; e, section of stem, and f, section of leaf of D. vernicosus. — Arctic ocean to Gulf, common in northern tier of States and northward, rare farther south. D. vernicosus (Lindb.) Warnst. is also strongly falcate-secund, with plicate leaves. It lives in swamps constantly wet, is more erect and has the outer layer of stem cells small and thick-walled.

- 151b In swamps, pools, lakes or wet meadows; leaves not plicate, and not  
curled round so far. .... 152
- 152a Outer layer of cells of stem larger and thinner walled than those next  
within. Fig. 141. .... D. intermedius

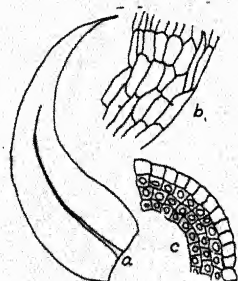


Figure 141

Fig. 141. Drepanocladus intermedius (Lindb.) Warnst. a, leaf; b, alar cells; c, section of stem. — In bogs across the continent, south to Mich. and Iowa. It is a slender plant, yellowish to green. D. revolvens (C. M.) Warnst. is stouter, reddish, with leaves very longly and slenderly acuminate, Col. to Alaska and Vancouver.

## HOW TO KNOW THE MOSSES

- 152b Outer layer of cells not different from underlying cells; alar cells greatly enlarged and conspicuous. Figs. 142, 143. ....153

- 153a Leaves entire; capsules provided with an annulus.

Fig. 142. .... D. aduncus

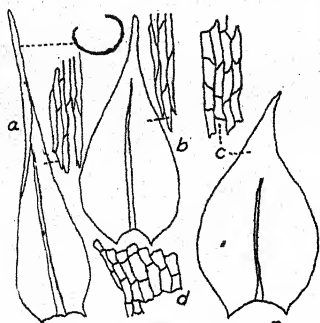


Figure 142

Fig. 142. Drepanocladus aduncus (Hedw.) Warnst. a, leaf and median cells of var. typicus; b, same, of var. Kneiffii; c, same, of var. polycarpus; d, alar cells. Common in temporary or permanent shallow calcareous waters or wet meadows, N. J. to Wis., Iowa and Wash., with many named forms; often two branches of one plant, or parts of one branch, belong to two named forms! D. Sendtneri (Schimp.) Warnst. has stouter midrib, fewer alar cells, but these have thickened yellow-brown walls.

- 153b Leaves serrulate at apex, often only very minutely so; without annulus.

Fig. 143. .... D. exannulatus

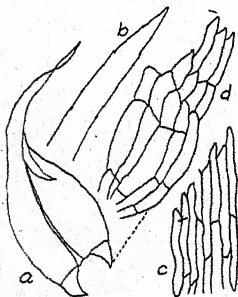


Figure 143

Fig. 143. Drepanocladus exannulatus (Guemb.) Warnst. a, leaf; b, acumination; c, median cells; d, alar cells. — N. J. to Col. and Wash., and northward, in non-calcareous waters, shores, and in swamps. Extremely variable, as is also D. fluitans (Hedw.) Warnst., which has shorter and thinner midrib and less abruptly enlarged alar cells.

- 154a Midrib reaching apex of leaf or nearly so; leaves cordate-ovate, flat or concave, with apex rounded. Fig. 144. .... Genus Calliergon

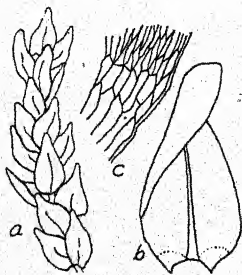


Figure 144

Fig. 144. Calliergon cordifolium (Hedw.) Kindb. a, shoot; b, leaf; c, alar cells. — In non-calcareous ponds or swampy places, N. J. to Wash. and northward. Eight similar species have similar range. They differ in length of midrib, thickness and color of alar cell walls, color and habit of plant.

## HOW TO KNOW THE MOSSES

- 154b Leaves sharply keeled along the midrib, in 3 rows on the stem.**  
**Figs. 145, 146. . . . . 155**

- 155a Leaves narrowly lanceolate, second to falcate-second.**  
**Fig. 145. . . . . Genus Dichelyma**

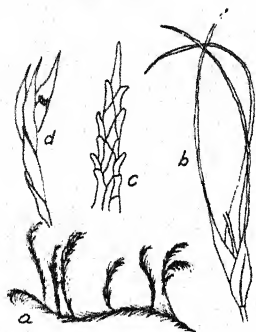


Figure 145

Fig. 145. Dichelyma capillaceum Bry. Eur. a, shoot; b, leaves; c, apex of leaf; d, capsule and perichaetium. — Normally wholly submerged in swamps, pools and slow streams, N. B. and Ont. to Tenn. and N. C. Three other species occur in northern U. S. and southern Canada, across to the Pacific coast.

- 155b Leaves oblong-lanceolate, neither second nor falcate-second.**  
**Fig. 146. . . . . Genus Brachelyma**

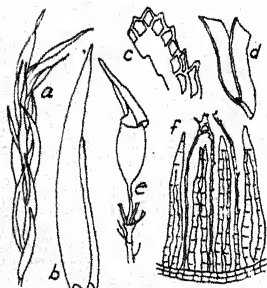


Figure 146

Fig. 146. Brachelyma subulatum (P. B.) Schimp. a, shoot; b, leaf; c, apex of leaf; d, section of leaf; e, seta, capsule and calyptra; f, peristome. — Floating in streams and rivers, Ga. to La., Ark. and Ill.

- 156a Plant with rhizomes, erect wiry stems and many leafy branches (dendroid). Fig. 147. (Compare Mnium Menziesii and Climacium). . . . . Genus Porotrichum**

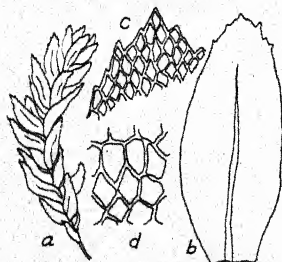


Figure 147

Fig. 147. Porotrichum alleghaniense (C. M.) Grout. a, shoot; b, leaf; c, apex and serration of leaf; d, upper median cells. — On damp rocks near streams, S. E. Canada to Ga., Ark. and Mo. Erect stems 2-3 cm. tall, leaves 2-3 mm. long.



# HOW TO KNOW THE MOSSES

- 156b Plants various but not dendroid. ....157
- 157a Alar cells enlarged, inflated. ....158
- 157b Alar cells quadrate or not differentiated, not inflated. ....160
- 158a (b, c) Leaves flat or spoon shaped, rounded at apex, erect or appressed.  
Calliergon .....154a
- 158b Leaves squarrose-recurved, acuminate.  
 Fig. 148. ....Campylium chrysophyllum

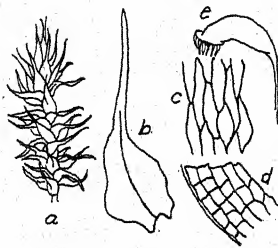


Figure 148

Fig. 148. Campylium chrysophyllum (Brid.) Bryhn. a, shoot; b, leaf; c, median cells; d, alar region; e, capsule. — In thin yellowish green mats on earth, soil or old wood, n. e. N. America to Ga., Tex., Ariz. and B. C. Leaves mostly crowded and overlapping, obscuring the stem; acumination long and slender, sub-tubular, often slightly denticulate at base. Very variable; extreme alar cells often markedly inflated. Dioicous.

- 158c Leaves more or less falcate secund, at least at tips of shoots. ....159
- 159a Leaves long-tapering-acuminate, lanceolate to ovate-lanceolate.  
 ..... Genus Drepanocladus .....151a
- 159b Leaves orbicular to ovate-lanceolate, acute or shortly and abruptly acuminate. Fig. 205. ....Hygrohypnum palustre .....216b
- 160a Leaves bordered with elongated, thick-walled cells in 2 layers; median cells rhomboid. Fig. 149. ....Genus Sciaromium

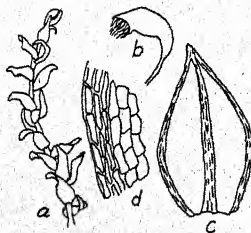


Figure 149

Fig. 149. Sciaromium Lescurii (Sull.) Broth. a, shoot; b, capsule; c, leaf; d, border of leaf. — In dark green mats on stones in brooks, mostly not submerged. Midrib very stout. Ontario and western Penna. to Cape Ann, Long Island, Ga. and Ala. Several species are known from S. America, and S. Fryei Williams from Cape Arago, Oregon.

- 160b Leaves not bordered. ....161



# HOW TO KNOW THE MOSSES

- 161a Leaves nearly circular, appressed, deeply concave, with abrupt slender tips; shoots fat and cylindric (julaceous).

Fig. 150. .... Genus Cirriphyllum

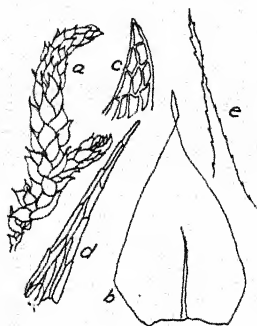


Figure 150

Fig. 150. Cirriphyllum Boscii (Schw.) Grout. a, shoot; b, leaf; c, apex of leaf; d, leaf apex of C. piliferum (Hedw.) Grout; e, leaf apex of C. cirrosum (Schw.) Grout. — Big shiny loosely julaceous mosses, sometimes in sods 20 ft. across, in shady woods or open fields. C. Boscii Vt. to Fla., La. and Iowa. C. piliferum, ocean to ocean, south to Penna. and Wash. C. cirrosum, Col. and Alaska; Europe.

- 161b Leaves ovate to lanceolate. .... 162

- 162a Median cells of leaf short, 2 to 5 times as long as wide; capsules erect. .... 163

- 162b Median cells of leaf elongated, 5 to 20 times as long as wide. ... 173

- 163a Cell walls very thick, the lumen elliptic to linear. Figs. 151-154. .... 164

- 163b Cell walls thinner, of equal thickness all around. Figs. 155-182. .... 166

- 164a (b, c) Leaves entire below, very shallowly denticulate above; plants of s. e. U. S. Figs. 153-154. .... 165

- 164b Leaves ovate, abruptly short-acuminate, plane and sharply serrate from base to apex; alar cells numerous, very small, thick-walled, often colored. Fig. 151. Pacific slope only. .... Genus Bestia

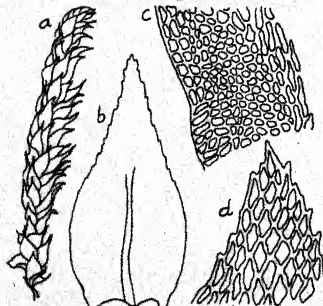


Figure 151

Fig. 151. Bestia Breweriiana (Lesq.) Grout. a, shoot; b, leaf; c, alar and median cells; d, margin of leaf. — Peristome perfect. Seta 10-15 mm. long. Branches curved, tapering at tips, julaceous. On trees and timbers, Calif. to Vancouver. Three other species have been collected 3 or 4 times each, on the Pacific Coast, Oregon to Vancouver.

# HOW TO KNOW THE MOSSES

- 164c Leaves with long tapering acumen, revolute below, sharply serrate above with long, slender, often reflexed teeth, often with accessory ribs on each side of midrib.

Fig. 152. Pacific coast only. . . . . Genus Antitrichia

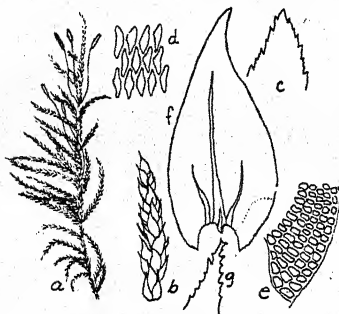


Figure 152

Fig. 152. Antitrichia curtipendula (Hedw.) Brid. a, shoot; b, twig; c, apex of leaf; d, median cells; e, alar cells; f, whole leaf with accessory ribs; g, apex of leaf of A. californica. — On shaded trees and rocks, Calif. to Alaska. — A. californica Sull. lacks the accessory ribs, and has the capsule longer (3-5 mm.); Cal. to B. C. and Col.

- 165a Seta shorter than perichaetial leaves; leaves 1.5-2 mm. long.

Fig. 153. . . . . Genus Leptodon

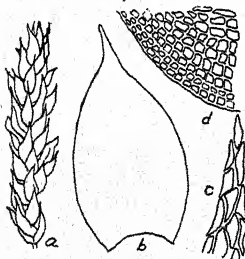


Figure 153

Fig. 153. Leptodon trichomitrium (Hedw.) Mohr. a, shoot; b, leaf; c, apex of leaf; d, alar cells. — Calyptra hairy; inner peristome rudimentary or lacking. On trees and rocks, N. E. to the Gulf. L. ohioensis Sull. is known only from central Ohio and L. nitidus Sull. from one locality, now destroyed by clearing, near Belleville, Ont.

- 165b Seta 3-4 mm. long, much longer than perichaetium; leaves .5-.7 mm. long. Fig. 154. . . . . Genus Clasmatodon

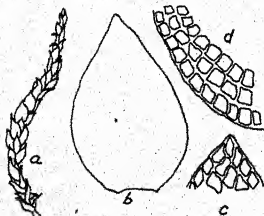


Figure 154

Fig. 154. Clasmatodon parvulus (Hampel) Sull. a, shoot; b, leaf; c, apex of leaf; d, alar cells. — Peristome single, very irregular; calyptra smooth. On trees, shrubs or rocks, Va. to Okla. and the Gulf, in thin, pale green mats.

- 166a Leaves distinctly serrate above.

Fig. 177. . . . . Brachythecium reflexum See 194b

- 166b Leaves entire, or slightly denticulate in lower half.

Figs. 148; 155-160. . . . . 167

# HOW TO KNOW THE MOSSES

167a Leaves squarrose-recurved, especially when wet.

Fig. 148. .... Campylium chrysophyllum ..... 158b

167b Leaves erect, spreading or appressed, not squarrose-recurved.

Figs. 155-160. .... 168

168a Leaves nearly at right angles to stem.

Fig. 155. .... Leptodictyum trichopodium



Figure 155

Fig. 155. Leptodictyum trichopodium (Schultz) Warnst. a, shoot; b, leaf and stem; c, alar region; d, median cells; e, capsule; f, leaf of var. Kochii. — Thin mats, or mixed with other mosses. Easily recognized when the leaves are slenderly acuminate and stand at right angles to the stem. But some specimens are hardly distinguishable from L. riparium, others from Amblystegium Juratzkanum or A. varium. The beginner had better ignore them! Var. Kochii is fairly distinct, by reason of its shorter midrib.

168b Leaves erect or appressed. .... 169

169a Capsules erect; inner peristome without cilia.

Fig. 128. .... Leskea nervosa 137b

169b Capsules curved, strongly contracted under the mouth when dry; cilia present. .... 170

170a Midrib very strong, to apex of leaf or beyond.

Figs. 156, 157. .... Genus Hygroamblystegium ..... 171

170b Midrib strong but stopping short of apex.

Figs. 158 - 160. .... Genus Amblystegium ..... 172

171a Leaves broadly to narrowly acuminate, about 1 mm. long; midrib reaching apex or nearly so; stems matted. Fig. 156. .... H. irriguum



Figure 156

Fig. 156. Hygroamblystegium irriguum (Wils.) Loeske. a, plant; b, leaf; c, basal cells; d, capsule; e, leaf of H. orthocladon (P. B.) Grout. — Very abundant in moist places, N. E. to Ga., Ark., and Calif. H. orthocladon is very similar, with the same range. H. irriguum varies greatly and is often hard to separate from Amblystegium varium, no. 172b.

# HOW TO KNOW THE MOSSES

- 171b Leaves lanceolate, with the very stout midrib extending beyond the apex (excurrent), 2-3 mm. long; stems to 15 cm. long.

Fig. 157. .... H. noterophilum

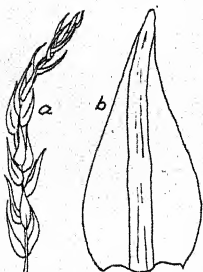


Figure 157

Fig. 157. Hygroamblystegium noterophilum (Sull.) Warnst. a, shoot; b, leaf. — A big dark green moss in large calcareous springs, rarely more than 100 ft. from where the water emerges from the rocks. Base and apex of leaf often 2 cells thick. N. E. to Penna. and Mont. H. irriguum var. spinifolium (Schimp.) Grout is similar but smaller, and grows in many streams.

- 172a (b, c) Midrib weak, ending near middle of leaf; margin entire; marginal cells at base quadrate or transversely elongated.

Fig. 158. .... A. serpens

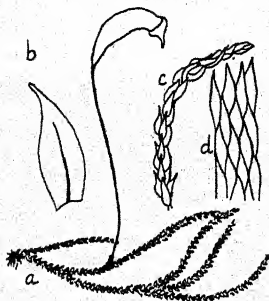


Figure 158

Fig. 158. Amblystegium serpens (Hedw.) Bry. Eur. a, shoot with capsule; b, leaf; c, dry twig; d, median cells. — In thin mats on earth or trees or old wood; leaves lanceolate, to 1.2 mm. long. A. Juratzkanum Schimp. has the leaves widely spreading when dry, without transversely elongated basal-marginal cells, and is slightly larger.

- 172b Midrib strong, reaching apex of leaf or nearly so; leaves entire; median cells 4 or 5 times as long as wide. Fig. 159. .... A. varium

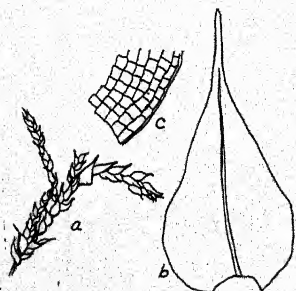


Figure 159

Fig. 159. Amblystegium varium (Hedw.) Lindb. a, plant; b, leaf; c, alar cells. — When the apex is as acuminate as figured, and the alar cells are in several parallel rows, recognition is easy. Many specimens closely resemble Hygroamblystegium irriguum, no. 171a, or H. orthocladon. On trees, wood, stones, earth, everywhere.

## HOW TO KNOW THE MOSSES

172c Midrib thin; cells 6 to 10 times as long as wide; margins serrulate.

Fig. 160. .... A. compactum

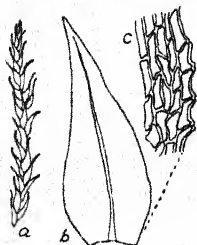


Figure 160

Fig. 160. Amblystegium compactum (C. M.) Aust. a, shoot; b, leaf; c, cells of leaf. — New York to Wash., in dense mats, to 2.5 cm. deep; slender; frequently with delicate brood filaments attached to back of midrib. — A. americanum Grout, Wis. to B. C., has more numerous paraphyllia; it is too much like A. compactum.

173a Complanate-foliate. .... 174

173b Leaves equally placed all around the stems. .... 176

174a Leaves acuminate. .... 175

174b Leaves rounded-obtuse, oblong-scutellar-shaped, minutely serrulate above; cilia lacking. Fig. 161. .... Genus Homalia

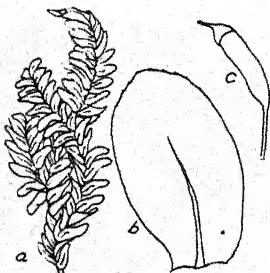


Figure 161

Fig. 161. Homalia Jamesii Schimp. a, shoot; b, leaf; c, capsule with operculum. — Little flat shiny sheets on shaded rock-faces, Nfd. to B. C., Penna. and Wash.; Upper Mich. Stems to 1.5 cm. long, leaves to 1.5 mm. Leaf cells linear fusiform, the apical and marginal broadly rhomboidal. Other species in Europe and Asia.

175a Leaves entire, the base obliquely attached to stem, often submerged.

Fig. 162. .... Leptodictyum riparium

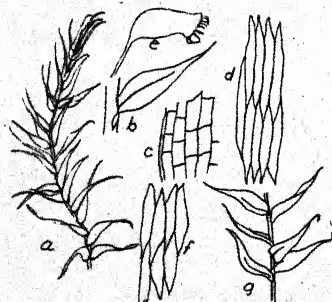


Figure 162

Fig. 162. Leptodictyum riparium (Hedw.) Warnst. a, shoot; b, leaf with portion of stem; c, alar cells; d, median cells; e, capsule; f, median cells of f. laxirete; g, shoot of f. fluitans. — Extremely variable in outline and habitat. Usually on moist soil or rotten wood; f. fluitans dangles a foot long in cold spring water; f. longifolia in quiet pools, and f. laxirete in shaded lawns in Iowa! In the extreme southeast L. siphon (P. B.) Broth. takes the place of L. riparium laxirete.



## HOW TO KNOW THE MOSSES

- 175b Leaves sharply serrate, the apex twisted.  
 Fig. 168. .... Eurhynchium serrulatum ..... See No. 186a
- 176a Alar cells thin walled, clear, inflated. .... 177
- 176b Alar cells less or not at all enlarged; leaves acute or acuminate. ... 178
- 177a Leaves ovate, somewhat concave, rounded at apex, decurrent.  
 Fig. 144. .... Calliergon cordifolium ..... See 154a
- 177b Leaves pointed at tip, usually falcate.  
 Figs. 202-205. .... Genus Hygrohypnum ..... See 214
- 178a (b, c) Leaves all bent to one side of stem (falcate-secund) at least at the hooked tips.  
 Figs. 140-141. .... Genus Drepanocladus ..... See 151
- 178b Leaves squarrose-recurved, spreading, slenderly acuminate.  
 Fig. 217. .... Campylium polygamum ..... See No. 228a
- 178c Leaves straight, or nearly so. .... 179
- 179a Leaves evenly tapering to a slender point, with several longitudinal folds (plicate). Figs. 163-165. .... 180
- 179b Leaves ovate to lanceolate, with curved outlines, with only two folds or none at all. Figs. 166-182. .... 182
- 180a Capsules oblong-cylindric, more or less curved; peristome perfect; large matted mosses, often yellowish.  
 .... Genus Camptothecium ..... 181
- 180b Capsules erect and symmetric; inner peristome imperfect, even the segments often reduced. Fig. 163. .... Genus Homalothecium

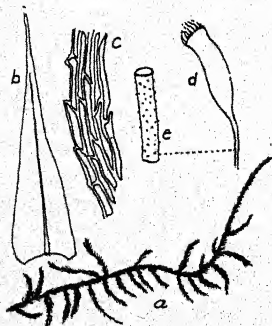


Figure 163

Fig. 163. Homalothecium Nuttallii (Wils.) Grout. a, shoot; b, leaf; c, cells of leaf; d, capsule; e, seta. — Seta rough, at least above; leaves dentate at base. More slender than Camptothecium, with slender, curved, tapering golden yellow branches. Calif. to B. C. and Mont. — H. nevadense (Lesq.) R. & C. is more slender, with leaves not dentate at base; same range.



## HOW TO KNOW THE MOSSES

- 181a Stems mostly erect, densely felted with brown radicles; in bogs and swamps. Fig. 164. .... C. nitens

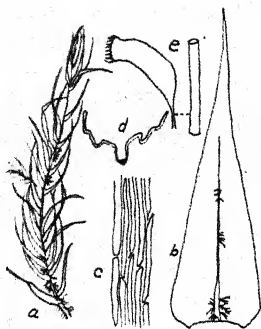


Figure 164

Fig. 164. Camptothecium nitens (Schreb.) Schimp. a, shoot; b, leaf; c, median cells; d, section of leaf; e, capsule and seta. — Seta smooth. Across N. America in northern tier of states and northward; also in Europe. It forms dense sods, with stems 6 to 15 cm. tall.

- 181b Stems creeping and matted together, with few if any radicles. Fig. 165. .... C. lutescens

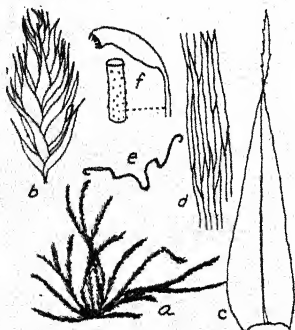


Figure 165

Fig. 165. Camptothecium lutescens (Huds.) Bry. Eur. a, shoot; b, twig; c, leaf; d, cells of leaf; e, section of leaf; f, capsule and seta. — Seta rough. Branching abundantly and irregularly, forming big glossy patches on trees, stumps and logs, northern U. S. and Canada west of the Rocky Mts.; also in Europe. — C. pinnatifidum (S. & L.) J. & S. has regular, pinnate branching. On soil and rocks, Cal. to B. C.

- 182a Beak of operculum as long as urn; plants glossy (except E. rusciforme); alar cells little or not at all differentiated. .... Genus Eurhynchium ..... 183

- 182b Beak conic or long-conic; alar cells quadrate; plants not glossy. ... 187

- 183a Apical cells of leaf short-rhomboidal to circular. Figs. 166, 167. .... 184

- 183b Apical cells not differentiated. .... 186

# HOW TO KNOW THE MOSSES

- 184a Broad-leaved aquatic in wiry tufts on stones in streams; seta smooth. Fig. 166. .... E. rusciforme

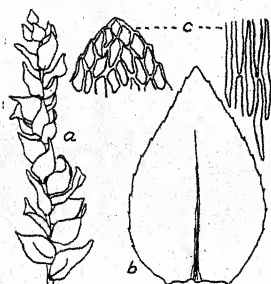


Figure 166

Fig. 166. Eurhynchium rusciforme (Neck.) Milde. a, shoot; b, leaf; c, cells of middle and apex of leaf. — Leaves erect-spreading when dry, serrulate nearly to the base, somewhat decurrent; alar cells thick-walled. A blackish moss, entangling much sand. Eastern U. S., and in Europe.

- 184b On soil and bases of trees in woods. .... 185

- 185a Leaves broadest 1/3 above base; seta rough. Fig. 167. .... E. hians

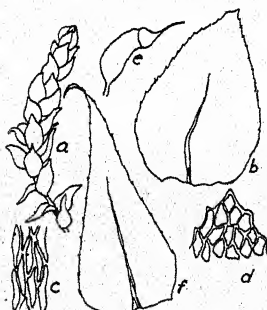


Figure 167

Fig. 167. Eurhynchium hians (Hedw.) J. & S. a, shoot; b, leaf; c, cells from middle, and d, from apex of leaf; e, capsule; f, stem leaf of E. strigosum (Hoffm.) Bry. Eur. — In delicate loose mats on soil, often among other mosses, Canada to the Gulf, west to Minn., Iowa and Mo. E. strigosum has a smooth seta. The slender typical form is northern: Labrador to N. Y., Col., Wash. and Alaska. Var. robustum Roell, has the same range as E. hians, but is more common northward.

- 185b Leaves broadest at base; seta smooth. Fig. 167. .... E. strigosum

- 186a Complanate-foliate, irregularly branched, in thin mats on soil and bark, eastern U. S.; seta smooth. Fig. 168. .... E. serrulatum

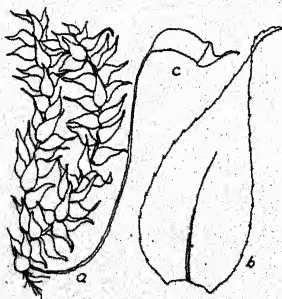


Figure 168

Fig. 168. Eurhynchium serrulatum (Hedw.) Kindb. a, shoot; b, leaf; c, capsule and operculum. — Common in shady places. Fr. autumn.

# HOW TO KNOW THE MOSSES

- 186b Robust, pinnately branched, to 25 cm. long, in large cushions, Calif. to B. C. and Idaho. Fig. 169. .... E. oregonum

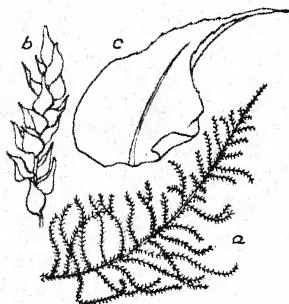


Figure 169

Fig. 169. Eurhynchium oregonum (Sull.) J. & S. a, shoot; b, twig; c, stem leaf. — Small specimens merge into E. Stokesii (Turn.) Bry. Eur., and this is often considered a variety of E. praelongum Bryhn of Europe. There is an unbroken series from a slender, diffusely branched plant to the big golden-yellow or green E. oregonum.

- 187a (b, c) With a large area of small, thick-walled, rounded alar cells; cilia well-developed. Fig. 170. .... Genus Pseudisothecium

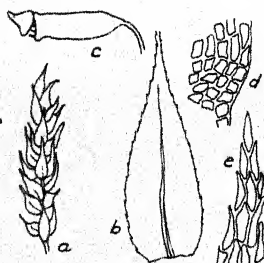


Figure 170

Fig. 170. Pseudisothecium stoloniferum (Hook.) Grout. a, shoot; b, leaf; c, capsule; d, alar region of P. myosuroides (Hedw.) Grout; e, leaf apex of same. — Almost dendroid, with stems to 5 cm. long; leaves to 2 mm. The small dense alar cells and inclined to nodding capsules are characteristic; Cal. and Col. to Alaska. In the East, P. myosuroides is found, rarely, from Nfd. to N. C., in high mountains. Common in western Europe.

- 187b With a large area of thin-walled, quadrate cells at base of leaf, from margin to midrib; cilia lacking; capsules erect.

Fig. 171. .... Genus Chamberlainia

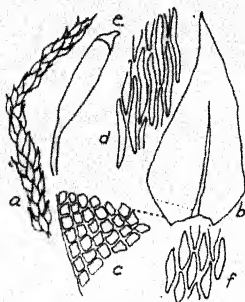


Figure 171

Fig. 171. Chamberlainia acuminata (Hedw.) Grout. a, shoot; b, leaf; c, basal cells; d, median cells; e, capsule; f, median cells of C. cyrtophylla (Kindb.) Grout. — In dense mats on bark, rarely on rocks or soil, eastern U. S. to Minn. and the Gulf. C. cyrtophylla is a poorly delimited species. C. acuminata varies from filiform to robust and julaceous.

# HOW TO KNOW THE MOSSES

- 187c With fewer alar cells, not reaching midrib, usually thin-walled, sometimes inflated; cilia well-developed. .... 188
- 188a Branches julaceous (cylindrical, densely and closely leafed); leaves smooth, concave; seta rough; western.  
Figs. 172, 173. .... Genus Scleropodium .... 189
- 188b Branches with leaves erect or appressed; if sub-julaceous the leaves have longitudinal folds (plicate); falcate-secund in one group of species; very abundant east of the Sierras and Cascades.  
Figs. 174-182. .... Genus Brachythecium .... 190
- 189a Leaves broadly ovate to suborbicular; median cells 8-10:1, alar distinctly inflated; in water or wet places. Fig. 172. .... S. obtusifolium

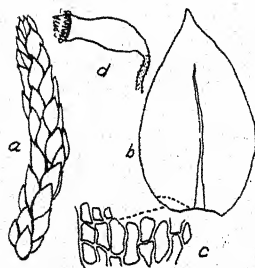


Figure 172

Fig. 172. Scleropodium obtusifolium (Hook.) Kindb. a, shoot; b, leaf; c, alar region; d, capsule. — A stout, matted moss, attached to stones in streams, Cal. to B. C., Mont. and Nev. — S. illecebrum (Hedw.) Bry. Eur. has leaves abruptly short-acuminate, and very few quadrate alar cells; but it merges into S. obtusifolium, and has a similar range, on drier ground.

- 189b Leaves ovate to lanceolate; stem leaves slenderly acuminate; alar cells numerous; only slightly julaceous. Fig. 173. .... S. caespitosum

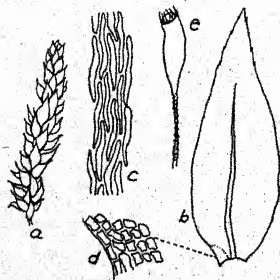


Figure 173

Fig. 173. Scleropodium caespitosum (Wils.) Bry. Eur. a, shoot; b, leaf; c, median cells; d, alar cells; e, capsule. — In loose mats on stumps, logs and rocks, Cal. to Alaska. — S. colpophyllum (Sull.) Grout has but few alar cells; it is hardly distinguishable from S. caespitosum. Two other species occur in North America.

## HOW TO KNOW THE MOSSES

- 190a Leaves plicate (with longitudinal folds), ovate-lanceolate.  
Figs. 174-176. ....191
- 190b Leaves not plicate, often concave with flat margin.  
Figs. 177-182. ....193
- 191a Alar cells small, numerous, quadrate, sharply differentiated, not notably dense or thick-walled. Fig. 174. ....B. oxycladon

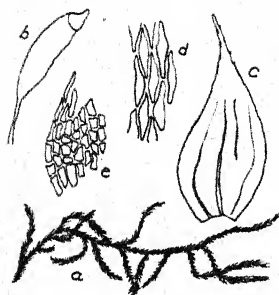


Figure 174

Fig. 174. Brachythecium oxycladon (Brid.) J. & S. a, shoot; b, capsule; c, leaf; d, median cells of var. dentatum; e, alar region. — Dioicous, and distinguished by the plicate leaves, long slightly curved capsules and alar cells. Very variable in size and arrangement of leaves, serration and acumination. Very common and abundant in northeast U. S., to Minn., Kan. and N. C., in woods, pastures, lawns. Merges into the next in vegetative characters.

- 191b Alar cells mostly open, similar to lower cells of leaf.  
Figs. 175-176. ....192

- 192a Leaves distinctly serrate. Fig. 175. ....B. salebrosum

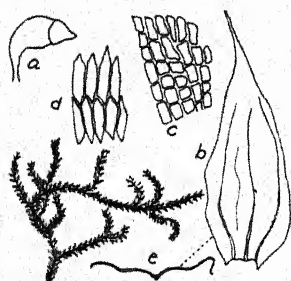


Figure 175

Fig. 175. Brachythecium salebrosum (W. & M.) Bry. Eur. a, capsule; b, leaf; c, alar cells; d, median cells; e, section of leaf. — Monoicous, and characterized by the short horizontal capsules and alar cells. More mesic than the preceding, the leaves more spreading. Very wide-spread over the same area as the preceding. At Grinnell, Iowa, it is abundant in shaded parts of the college campus, whereas on roadsides and in woods and pastures B. oxycladon is everywhere. Europe. A form with seta rough above is B. campestre Bry. Eur.

# HOW TO KNOW THE MOSSES

192b Leaves entire or very finely denticulate; plants large.

Fig. 176. .... B. albicans

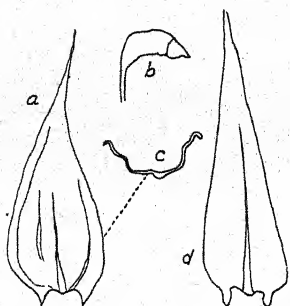


Figure 176

Fig. 176. Brachythecium albicans (Hedw.) Bry. Eur. a, leaf; b, capsule; c, section of leaf; d, leaf of B. acutum. A big moss, in light green mats on rocks or soil, Colorado northward and westward; dioicous; leaf apex very slender. B. flexicaule R. & C., Nfd., N. J., Iowa, B. C., is monoicous, with leaves very much like those of Leptodictyum riparium. I consider it a wet habitat form of B. salebrosum. B. acutum (Mitt.) Sull. is monoicous, with leaves wedge-shaped, i. e., the sides are straight, from the broad base to apex.

193a Leaves straight, not secund. .... 194

193b Leaves more or less secund; plants small.

Figs. 181, 182. .... 196

194a (b, c) Leaves ovate-deltoid; seta rough; large plants.

Figs. 179-180. .... 195

194b Leaves triangular-ovate (on stem), decurrent; median cells 3-5:1; small species. Fig. 177. .... B. reflexum

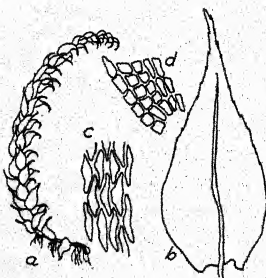


Figure 177

Fig. 177. Brachythecium reflexum (Starke) Bry. Eur. a, plant; b, leaf; c, median cells; d, alar region. — Stems filiform, to 10 cm. long; midrib stout, extending into the slender acumens; cells short; monoicous; seta very rough. On logs, roots or soil, northern U. S. and eastern Canada. B. Starkei (Brid.) Bry. Eur. extends to Penna. and Vancouver; leaves to 1.7 mm. long, midrib little more than half the length of the leaf, cells 13:1, monoicous; rough seta and short, dark, horizontal capsule as in B. reflexum.



# HOW TO KNOW THE MOSSES

194c Leaves ovate-lanceolate, concave; Fig. 178. .... B. flagellare

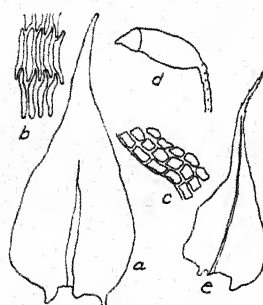


Figure 178

Fig. 178. Brachythecium flagellare (Hedw.) Jenn. a, leaf; b, median cells; c, alar region; d, capsule; e, leaf of B. populeum (Hedw.) Bry. Eur. — B. flagellare has smooth spoon-shaped-concave leaves, seta rough above, nearly black; capsule horizontal to sub-erect; operculum long-conic. On moist rocks in brooks, northeast U. S. and Canada to Iowa and B. C. — B. populeum (Hedw.) Bry. Eur. has a similar leaf, slightly shorter cells (5-8:1), more numerous alar cells, the midrib extending to tip of leaf; autoicous; seta rough above.

195a Alar cells large but not inflated; in mesic habitats.

Fig. 179. .... B. rutabulum

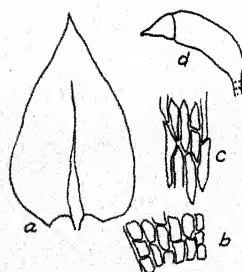


Figure 179

Fig. 179. Brachythecium rutabulum (Hedw.) Bry. Eur. a, leaf; b, alar region; c, median cells; d, capsule. — A big moss in bright green mats on soil or rocks, trees or old logs, in damp woods, northeast U. S. and Canada, to Penna., Mo. and Mont. Monoicous; seta rough. Leaves to 2 mm. long. Variable, sometimes resembling B. salebrosum.

195b Alar cells numerous, inflated, colorless, decurrent; hydric.

Fig. 180. .... B. rivulare

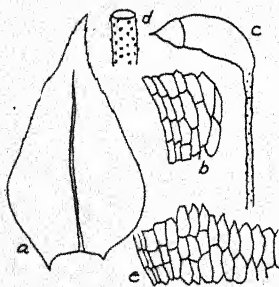


Figure 180

Fig. 180. Brachythecium rivulare Bry. Eur. a, leaf; b, alar region; c, capsule; d, seta; e, alar region of B. Nelsoni Grout. — A big, light green moss, in or near springs or brooks, ocean to ocean, south to Va. and Mo. Leaves ovate-lanceolate, to 1.5 mm. long, concave, acute or broadly acuminate, serrate; median cells 10-15:1; dioicous; seta very rough. Variable, often approaching B. rutabulum. — B. Nelsoni is a form with long-acuminate leaves and more numerous inflated alar cells. Colo. and Wyo.

# HOW TO KNOW THE MOSSES

196a Seta very rough; cells 12:1; capsule short, curved.

Fig. 181. . . . . B. velutinum



Figure 181

Fig. 181. Brachythecium velutinum (Hedw.) Bry. Eur. a, shoot; b, leaf; c, alar region; d, capsule, with operculum, and open. — In slender velvety dark green mats on earth, stones or trees; leaves serrate, more or less falcate. Monoicous. Northern U. S. and Canada, to N. J. and Calif. Europe.

196b Seta smooth or slightly roughened; cells 3-6:1; capsule more or less curved. Fig. 182. . . . . B. collinum

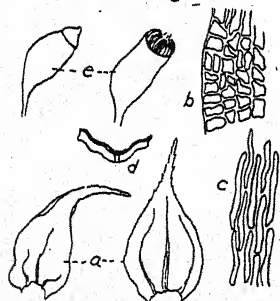


Figure 182

Fig. 182. Brachythecium collinum (Schleich.) Bry. Eur. a, leaf; b, alar region; c, median cells; d, section of leaf; e, capsule with and without operculum. — In thin interwoven mats on earth and rocks in mountains: N. Mex. to Peace River; Mt. Shasta; Greenland; Europe. Leaves ovate, to 0.9 mm. long; midrib extending to middle; monoicous.

197a Aquatic, long and dangling, often in dense tufts; alar cells inflated. Figs. 183 - 185. . . . . Genus Fontinalis . . . . . 198

197b Terrestrial; xeric, mesic or hydric, not constantly submerged. . . . . 200

198a Leaves folded and sharply keeled along the midrib, at least, above. Fig. 183. . . . . F. antipyretica

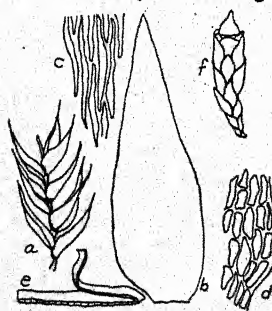


Figure 183

Fig. 183. Fontinalis antipyretica Hedw. a, shoot; b, leaf; c, median cells; d, alar cells; e, section of leaf; f, capsule with operculum — Var. gigantea Sull. has leaves to 8 mm. long and 6 mm. wide. Capsules rarely seen; inner peristome a cone-shaped network. Formerly reputed as a febrifuge, because it grows in cold water, not because it really reduces a fever! N. America, Europe, Asia and Africa. F. neomexicana Sull. & Lesq., Rocky Mts. to Pacific Coast, has leaves relatively broader and more acute.

# HOW TO KNOW THE MOSSES

198b Leaves rounded on the back, not keeled. Figs. 184, 185. . . . . 199

199a Stem leaves more or less concave and channeled, rather firm in texture. Fig. 184. . . . . F. dalecarlica

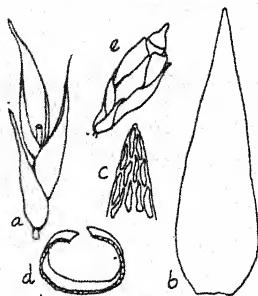


Figure 184

Fig. 184. Fontinalis dalecarlica Bry. Eur. a, shoot; b, leaf; c, apex of leaf; d, section of leaf; e, perichaetium and capsule. — Leaves 2-4 mm. long; shoots slender. Greenland and Labr. to Wisc., Ind. and Tenn. Europe. F. novae-angliae, N. E. to Okla. and Ga., has broader leaves, 3-7.5 mm. long; shoots more robust.

199b Stem leaves flat or slightly concave, soft and limp.

Fig. 185. . . . . F. Duriaei

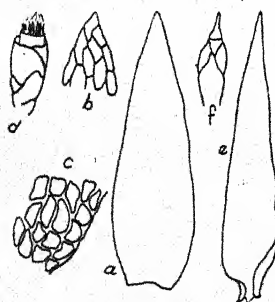


Figure 185

Fig. 185. Fontinalis Duriaei Schimp. a, leaf; b, apex of leaf; c, alar cells; d, perichaetium and capsule; U. S. and Canada. — F. Lescurii Sull. e, leaf; f, perichaetium and capsule. N. S. to Ala. and the Rocky Mts. Leaves rather distant. A difficult group. Twenty-four species of Fontinalis are recognized in N. America by Dr. Winona Welch in M. F. N. A.

200a Median leaf cells 2-5:1, that is, relatively short.

Figs. 186 - 192. . . . . 201

200b Median leaf cells 5-20:1, that is, long to very long.

Figs. 193 - 232. . . . . 207

201a Cell walls very thick, the lumen elliptic to linear; alar cells very numerous. Figs. 186, 187. . . . . 202

201b Cell walls thinner, equally thick all around. . . . . 204

202a Secondary stems little branched; calyptra smooth.

Fig. 186. . . . . Genus Leucodon . . . . . 203

202b Secondary stems freely and often pinnately branched.

Fig. 153. . . . . Genus Leptodon . . . . . See 165a

# HOW TO KNOW THE MOSSES

- 203a Seta shorter than perichaetial leaves; leaves gradually acuminate. Fig. 186. .... L. brachypus

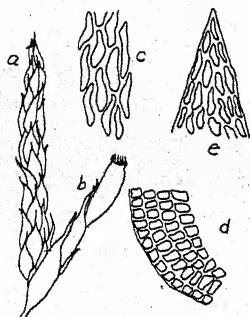


Figure 186

Fig. 186. Leucodon brachypus Brid. a, shoot; b, sporophyte and perichaetium; c, median cells of leaf; d, basal cells of leaf; e, apex of leaf. — Branches julaceous, hard and smooth when dry, making large, harsh, curly tufts and sheets, 2 to 4 cm. deep, on trees or rocks, N. E. to Ont., Ga. and Kan. Leaves smooth, not plicate.

- 203b Seta longer than perichaetium; leaves slenderly acuminate, very strongly plicate, wet or dry. Fig. 187. .... L. sciurioides

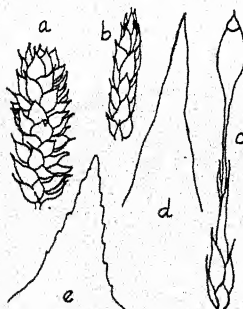


Figure 187

Fig. 187. Leucodon sciurioides (Hedw.) Schw. a, wet shoot; b, dry shoot; c, sporophyte and perichaetium; d, apex of leaf; e, apex of leaf of L. julaceus (Hedw.) Sull. — These two species are very much alike. Beside the difference in acumination and plication, L. julaceus leaves are mammillose-roughened on the back at the apex. The first occurs from N. E. to Penna. and Iowa, the second to Minn., Texas and Fla.

- 204a (b, c) Leaves entire. .... 205

- 204b Leaves very finely denticulate, squarrose-recurved from a concave base. Fig. 188. .... Campylium hispidulum

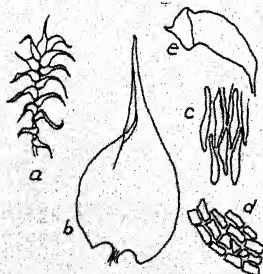


Figure 188

Fig. 188. Campylium hispidulum (Brid.) Mitt. a, shoot; b, leaf; c, median cells; d, alar region; e, capsule. — In thin yellowish mats on old wood, bark or earth in woodlands, north-eastern North America to N. C., Tex., Idaho and B. C. Leaves to 0.75 mm. long, widely spreading, abruptly contracted to the acumination, finely serrulate all round. Monoicous.

## HOW TO KNOW THE MOSSES

204c Leaves coarsely toothed with whole projecting cells.

Fig. 189. .... Genus Fabronia

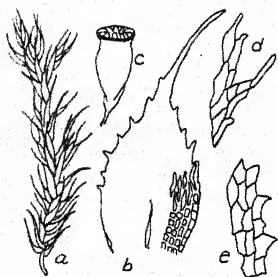


Figure 189

Fig. 189. Fabronia ciliaris (Brid.) Brid. a, shoot; b, leaf; c, capsule; d, margin of leaf; e, margin of leaf of F. pusilla Raddi. — Very small pale green mats on bark or rocks; peristome teeth easily broken off. F. ciliaris ranges from N. J. to Minn., Ariz. and Ga. F. pusilla from N. Mex. to Colo., Cal. and B. C.; F. Ravenelii, with leaves nearly entire, is found from Penna. to Tenn. and Ga.

205a Cells very large and clear, .05-.06 mm.; alar cells not different.

Fig. 190. .... Genus Hookeria

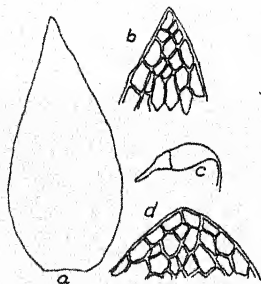


Figure 190

Fig. 190. Hookeria acutifolia Hook. a, leaf; b, cells of apex of leaf; c, capsule of H. lucens; d, apex of leaf of same. — Pale watery mosses, the former on dripping ledges, Conn. to Ohio and Ga. (also India, Ceylon, Java, West Indies and S. America!), the latter Cal. to Vancouver, and in Europe. The cells are easily seen with an ordinary hand lens.

205b Cells .007-.008 mm. wide; quadrate alar cells small, numerous.

Figs. 191, 192. .... 206

206a Cilia perfect; leaves 0.8 to 1.2 mm. long.

Fig. 191. .... Genus Homomallium

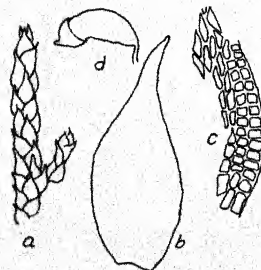


Figure 191

Fig. 191. Homomallium adnatum (Hedw.) Broth. a, shoot; b, leaf; c, alar and median cells; d, capsule and operculum. — Thin dark green mats adhering closely to rocks or stones, to be scraped off with a knife. Ont. to Col., Tex. and W. Va.; common in midwest. Superficially resembling Leskea and Sematophyllum, but easily distinguished when capsules are present.



## HOW TO KNOW THE MOSSES

206b Cilia absent; leaves 0.1 to 0.6 mm. long.

Fig. 192. .... Genus Amblystegiella

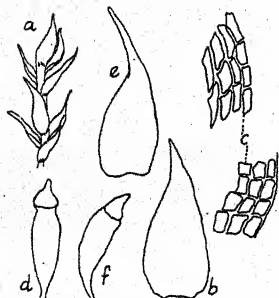


Figure 192

Fig. 192. Amblystegiella subtilis (Hedw.) Loeske. a, shoot; b, leaf; c, alar and median cells; d, capsule and operculum; e, leaf of A. confervoides (Brid.) Loeske; f, capsule of same. — Very small matted mosses, the former on bark, Ont. to Minn., Ill. and Penna.; the latter on limestone rocks, N. E. to Iowa and Col. Two species, still smaller, are reported. A. subtilis lacks cilia in the peristome; A. confervoides has cilia.

207a (b, c, d) With one inflated cell at extreme basal angle, and many quadrate cells; tips of shoots often crowded with buds (gemmae).

Fig. 193. .... Genus Platygyrium

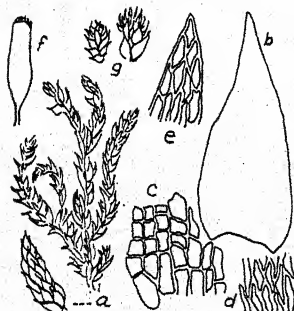


Figure 193

Fig. 193. Platygyrium repens (Brid.) Bry. Eur. — a, shoot; b, leaf; c, alar region; d, median cells; e, apex of leaf; f, capsule; g, gemmae. — In dark green mats on bark. Common east of the Rocky Mts. Characterized by the straight, leaves, the erect cylindric capsule, and segments very narrow; no cilia. With a hand lens the clustered gemmae are distinctive.

207b With several (2 or more) inflated alar cells.

Figs. 194 - 216. .... 208

207c With small quadrate alar cells. Figs. 217-223. .... 227

207d With little or no differentiation of alar cells.

Figs. 224 - 232. .... 234

208a (b, c) Alar cells in a transverse row of 3 or 4 adjacent to stem. Operculum with beak as long as urn.

Figs. 194, 195. .... Genus Sematophyllum. .... 209

208b Alar cells in a cluster, 3 or 4 transversely and 3 or 4 up margin of leaf. Figs. 196, 197. .... 210

208c Alar cells more numerous, less swollen, thicker walled, often colored. Figs. 198 - 216. .... 211



## HOW TO KNOW THE MOSSES

209a Slender plants on trees or old wood; capsules erect.

Fig. 194. .... S. adnatum

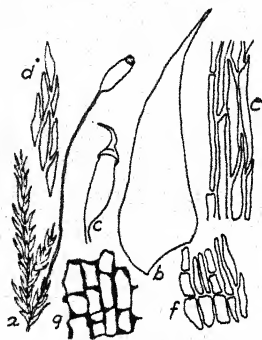


Figure 194

Fig. 194. Sematophyllum adnatum (Mx.) E. G. B. a, shoot; b, leaf; c, capsule with operculum; d, apex of leaf; e, median cells; f, alar cells; g, cells of capsule wall. — In patches on bark of living trees, R. I. to Iowa, Fla. and Tex. Ends of shoots may be curved away from the substratum somewhat as in Pylaisia. The operculum, the thick-walled outer cells of the urn, the alar cells, and the broadly reflexed margins of the leaves, and their yellowish color, characterize Sematophyllum.

209b In mats on rocks; capsules inclined and curved, contracted below the mouth when dry. Fig. 195. .... S. carolinianum

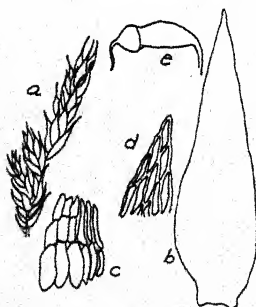


Figure 195

Fig. 195. Sematophyllum carolinianum (C.M.) E. G. B. a, shoot; b, leaf; c, alar cells; d, apex of leaf; e, capsule with operculum. — In yellowish green mats closely attached to moist rocks, Canada to Ga. and Iowa. Like the preceding species, except as to capsule. S. marylandicum (C. M.) E. G. B. is much larger, with leaves 1.5-2.5 mm. long; otherwise much like the preceding; on damp stones in mountains, N. H. to Ga.

210a Alar cells scarcely decurrent; leaves complanate and falcate-secund, sharply serrate on the slender acumination; capsules inclined, smooth. Fig. 196. .... Genus Brotherella

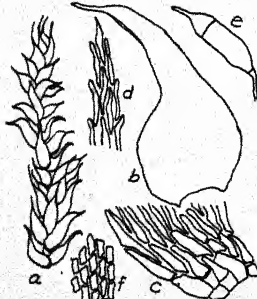


Figure 196

Fig. 196. Brotherella recurvans (Mx.) Fleisch. a, shoot; b, leaf; c, alar cells; d, apex of leaf; e, capsule with operculum; f, outer cells of capsule. — Glossy, pale green mats on rotten wood, soil or bases of trees, Nfd. to Man. and Ga. The thin-walled outer cells of the urn distinguish this from Sematophyllum. A similar plant of the northwest coast is B. Roellii. Two very similar species occur in the east.

# HOW TO KNOW THE MOSSES

- 210b Alar cells decurrent; leaves squarrose, finely serrulate above; capsules longitudinally furrowed when dry. Fig. 197. . . . . Plagiothecium striatellum

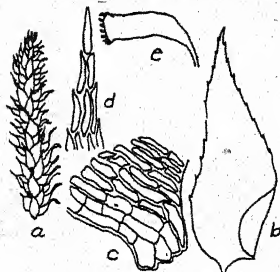


Figure 197

Fig. 197. Plagiothecium striatellum (Brid.) Lindb. a; shoot; b, leaf; c, alar cells; d, apex of leaf; e, capsule. — On stones, rotten wood or peaty soil in damp shady places, Arctic America to N. C. Common on Long Island, N. Y. Resembling a small Campylium, but easily distinguished by the alar cells and the furrowed capsules.

- 211a (b, c) Leaves erect, straight, broad, blunt, sometimes more or less falcate. Fig. 199 - 205. . . . . 212

- 211b Leaves squarrose-recurved, long tapering, entire. Fig. 198. . . . .

Campylium stellatum

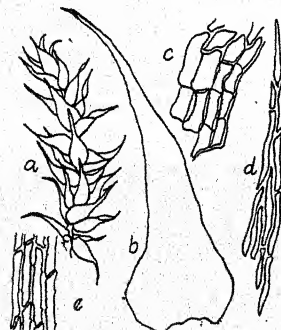


Figure 198

Fig. 198. Campylium stellatum (Hedw.) L. & J. a, shoot; b, leaf; c, alar cells; d, apex of leaf; e, cells from lower part of leaf. — Mostly erect, in dense patches in bogs or fens, Penna., Ohio, Iowa, and Wash. to Canada and Alaska. Stems to 10 cm. long, leaves to 3 mm. with apex semi-tubular; cell walls thick and 'porose, especially at base. Approaches C. polygamum, No. 228a, Fig. 217.

- 211c Leaves complanate. Figs. 206 - 216. . . . . 217

- 212a (b, c) Leaves deeply concave, spoon-shaped, obtuse and rounded at apex. Figs. 200, 201. . . . . Genus Calliergonella. . . . . 213

- 212b Leaves deeply concave, curved so that the shoots are hooked at the tips, rugose (wrinkled) when dry. Fig. 199. . . . . Genus Scorpidium

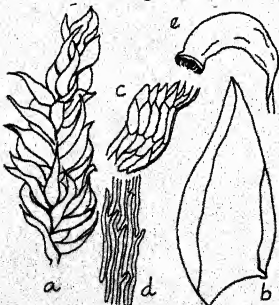


Figure 199

Fig. 199. Scorpidium scorpioides (Schimp.) Limpr. a; shoot; b, leaf; c, alar region; d, median cells; e, capsule. — Big erect moss, to 30 cm. long, in tufts or masses, in bogs or still shallow water, ocean to ocean in northern U. S. and Canada, to N. J., Mich., Mont. Leaves 2-4 mm. long, very concave, making the shoots very stout. Rarely fruiting. In fact it is a rare find.

# HOW TO KNOW THE MOSSES

212c Leaves ovate to orbicular, acute or abruptly short-acuminate, spreading, more or less falcate-second.

Figs. 202 - 205. .... Genus Hygrohypnum. .... 214

213a Tips of stems ending in a firm acute bud; alar cells much inflated, thin-walled, clear. Fig. 200. .... C. cuspidata

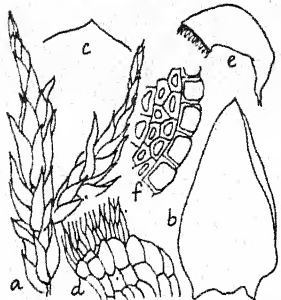


Figure 200

Fig. 200. Calliergonella cuspidata (Brid.) Loeske. a, shoot; b, leaf; c, apex of leaf; d, alar region; e, capsule; f, section of stem. — A stout moss of wet meadows, swamps and fens, ocean to ocean in northern U. S. and Canada, to N. J. and Iowa. Tolerant of lime, if not actually preferring calcareous waters. Characterized by the cuspidate terminal buds; dioicous. Europe.

213b Tips loose; stems red; alar cells somewhat enlarged, usually colored and opaque. Fig. 201. .... C. Schreberi

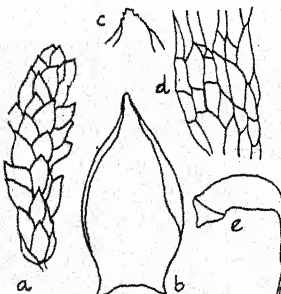


Figure 201

Fig. 201. Calliergonella Schreberi (Bry. Eur.) Grout. a, shoot; b, leaf; c, apex of leaf; d, alar region; e, capsule. — Usually pinnately branched, forming great cushions, often over wide areas, 10-15 cm. deep, in many kinds of soil and exposure, ocean to ocean in northern U. S. and Canada, to Va., Iowa and Col. The red stems, smooth concave leaves with turned-back points, and alar cells easily characterize this abundant moss. Europe.

214a Outer cells of stem thin-walled, clear and colorless.

Fig. 202. .... H. ochraceum

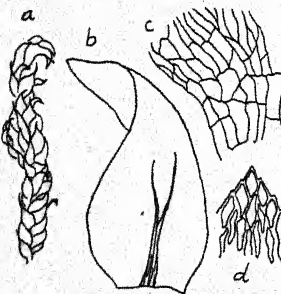


Figure 202

Fig. 202. Hygrohypnum ochraceum (Turn.) Loeske. a, shoot; b, leaf; c, alar and adjacent cells; d, apex of leaf. — Medium size to large, to 9 cm. long; very variable. On stones in cool mountain brooks, N. J., W. Va., Col., B. C. and northward. Europe.

# HOW TO KNOW THE MOSSES

- 214b Outer cells of stem small and thick walled. .... 215
- 215a Leaves lanceolate to ovate-lanceolate. Figs. 204, 205. .... 216
- 215b Leaves broadly ovate to sub-orbicular. Fig. 203. .... H. dilatatum

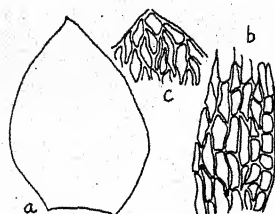


Figure 203

Fig. 203. Hygrohypnum dilatatum (Wils.) Loeske. a, leaf; b, alar and adjacent cells; c, apex of leaf. — This (Va. to N. Mex., Wash. and northward) and H. molle (Schimp.) Loeske of the northwest are much alike, and grade into one another. H. molle, as the name implies, is soft and flaccid; H. dilatatum is "stiff and harsh to the touch when dry".

- 216a Leaves serrulate in upper half. Fig. 204. .... H. novae-caesareae

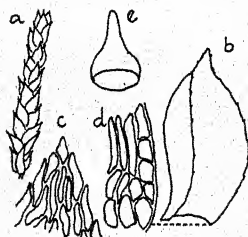


Figure 204

Fig. 204. Hygrohypnum novae-caesareae (Aust.) Grout. a, shoot; b, leaf; c, apex of leaf; d, basal cells; e, operculum. — Cilia lacking. Thin mats on stones in cold mountain streams, Vt. to Ga. and western Penna. Europe. Our large specimens are var. badense Herzog. Braithwaite considered it a Sematophyllum, and it is so treated (Raphidostegium) in Grout's Mosses with Hand lens and Microscope.

- 216b Leaves entire or nearly so; alar cells distinctly inflated.

Fig. 205. .... H. eugyrium

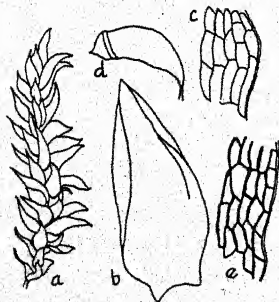


Figure 205

Fig. 205. Hygrohypnum eugyrium (Bry. Eur.) Loeske. a, shoot; b, leaf; c, alar cells; d, capsule; e, alar cells of H. palustre (Hedw.) Loeske. — H. eugyrium is found in cool mountain streams, N. C. to Col., Wash. and northward; H. palustre N. J. to Col., Wash. and northward. H. palustre is extremely variable. Both occur also in Europe.

## HOW TO KNOW THE MOSSES

- 217a Leaves shiny, not falcate-secund; alar cells in a cluster, enlarged and clear. Fig. 206. .... Genus Heterophyllum**

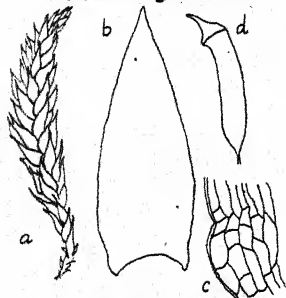


Figure 206

Fig. 206. Heterophyllum Haldanianum (Grev.) Kindb. a, shoot; b, leaf; c, alar cells; d, capsule. — Leaves entire, margins plane, median cells 16:1, not decurrent. The very smooth flat sprays in wide mats, and nearly erect capsules are characteristic. Common on old wood, stones and peaty soil in mesic woods, N. S. to Mont. and the Gulf, Europe. — H. nemorosum (Koch) Kindb., Va. to Ga., has serrate leaves, especially on the slender acumen.

- 217b Leaves falcate-secund.**

**Figs. 207 - 216. .... Genus Hypnum ..... 218**

- 218a Outer cells of stem large, thin-walled and colorless.**

**Figs. 207, 208. .... 219**

- 218b Outer cells small and thick-walled. Figs. 209 - 211. .... 220**

- 219a Alar cells conspicuously inflated, colorless; leaves broadly acuminate, acute or obtuse. Fig. 207. .... H. Patientiae**



Figure 207

Fig. 207. Hypnum Patientiae Lindb. a, shoot; b, leaf; c, alar cells; d, capsule; e, section of stem. — Fla., Col., and Wash. to the Arctic Ocean, common in moist places; shiny, with leaves broad-pointed, and decurrent; stems red. H. pratense Koch, complanate but not falcate-secund, has less marked alar cells, bordered by smaller quadrate cells; merges into H. Patientiae, with similar range, south to N. J., Col. and Vancouver.

- 219b With 3 or 4 sub-quadrate alar cells; leaves long-filiform-acuminate.**

**Fig. 208. .... H. subimponens**

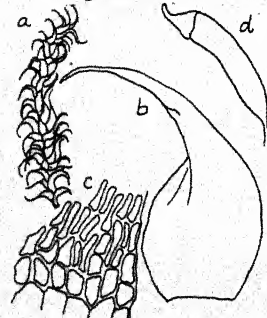


Figure 208

Fig. 208. Hypnum subimponens Lesq. a, shoot; b, leaf; c, alar cells with thin-walled cortical cells of stem; d, capsule. — Stems green or brown; branching regularly complanate-pinnate; median cells 7-10:1. In wide thick mats in moist woods, Calif. to Alaska. — H. callichroum, with similar stem, has leaves long acuminate and coiled, entire; alar cells hyaline-inflated, numerous; N. S. to B. C. and northward. Europe.



# HOW TO KNOW THE MOSSES

220a Margins of leaves strongly revolute nearly to apex, entire.

Fig. 209. .... H. revolutum

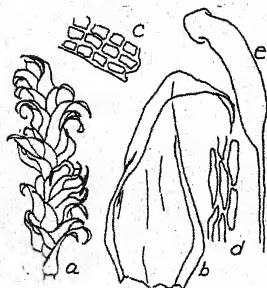


Figure 209

Fig. 209. Hypnum revolutum (Mitt.) Lindb. a, shoot; b, leaf; c, alar cells; d, median cells; e, capsule. — On bare rocks, N. Mex. to Calif., Black Hills and the Arctic; abundant in the Colorado Rockies. Very variable in size — filiform to robust — irregularly branched to regularly pinnate—tufted or matted—but always with leaves revolute, at least near base, numerous quadrate alar cells, and short leaf-cells, 3-7:1.

220b Margins plane or more or less reflexed.

Figs. 210-216. .... 221

221a Branching evenly pinnate, the branches crowded-complanate, and of equal length; leaves plicate, the tips bent toward the base of the main stem. Fig. 210. .... H. crista-castrensis

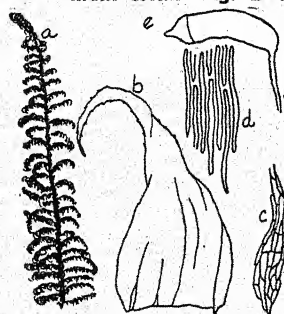


Figure 210

Fig. 210. Hypnum crista-castrensis Hedw. a, shoot; b, leaf; c, alar cells; d, median cells; e, capsule. — The most beautiful of feathery or frondose mosses, said to be on the Coat of Arms of the House of Lancaster. In dense mats, the crowded fronds more or less erect. On rocks, old logs or peaty soil, N. C., Iowa, Wash. and northward.

221b Branching less precise to irregular; leaves bent toward the substratum. .... 222

222a Stem leaves cordate-auriculate at base, slenderly long-acuminate, serrate from base to apex; branch leaves much smaller, more serrate; mostly pinnate and frondose, yellowish. Fig. 211 .... H. molluscum

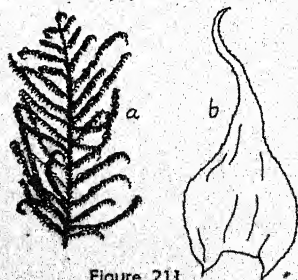


Figure 211

Fig. 211. Hypnum molluscum Hedw. a, shoot branching; b, leaf. — A pretty, golden-green moss in moist shaded woods of Europe and America, south to Ga. and Okla., west to the Rocky Mts. Leaves more or less papillose on the back above. Related to Hylocomium by the dimorphic, serrate, papillose leaves.



# HOW TO KNOW THE MOSSES

222b Not exactly as above. .... 223

223a Leaves cordately contracted to the stem.

Figs. 212 - 213. .... 224

223b Leaves not cordate at base, tapering to the insertion.

Figs. 214 - 216. .... 225

224a Leaves entire, or serrulate near apex; decurrent cells at basal angles inflated, colorless; E. Canada to Ga. and Col.

Fig. 212. .... H. curvifolium

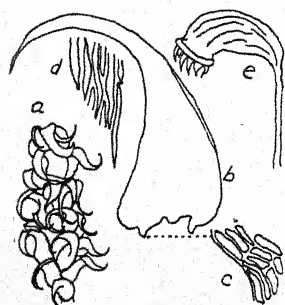


Figure 212

Fig. 212. Hypnum curvifolium Hedw. a, shoot; b, leaf; c, alar region; d, median cells; e, capsule. — A handsome golden-green moss, in wide firm mats; leaves very evenly falcate second. Often used by florists as "sheet moss", for whom it is collected in the southeast. On rocks, old logs or peaty soil, Ga., Mo. and Col. to Arctic America. The base of the leaf, and the furrowed curved capsules are characteristic.

224b Leaves serrulate; acumination very long and slender, circinate coiled; Calif. to Alaska and Idaho. Fig. 213. .... H. circinale

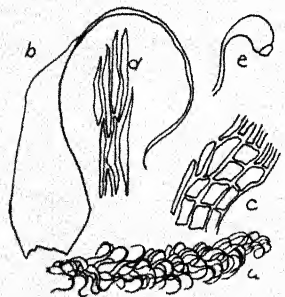


Figure 213

Fig. 213. Hypnum circinale Hook. a, shoot; b, leaf; c, alar region; d, median cells; e, capsule. — In broad mats; branching regularly pinnate. The slender, coiled leaves and small capsules are very characteristic. Common from Calif. to Alaska and Idaho, on trees, stones and old wood.

225a Leaves entire; alar cells very numerous, opaque.

Fig. 214. .... H. cupressiforme Hedw.

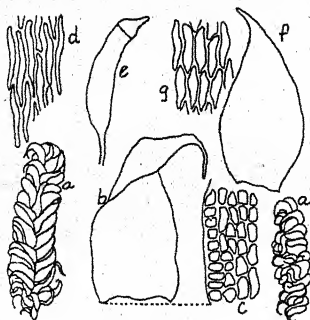


Figure 214

Fig. 214. Hypnum cupressiforme. a, shoot from top (left) and from side (right); b, leaf; c, alar cells; d, median cells; e, capsule; f, leaf, and g, median cells of H. Vaucheri Lesq. — Rare, but everywhere in N. America. Extremely variable, especially in western Europe, where it is very abundant. Var. filiforme Brid. hangs in sheets of green threads on bark or rocks. Our most robust form is H. Vaucheri, Ariz. to B. C., Nebr., Minn., Nfd. and Grant Land! It has much shorter leaf-cells, and more numerous alar cells, 12-15 on the margin of the leaf (6-10 in H. cupressiforme).

225b Leaves serrulate to the base. Figs. 215, 216. .... 226

226a Leaves 2 mm. long; alar cells thick-walled, orange-brown when old.

Fig. 215. .... H. imponens

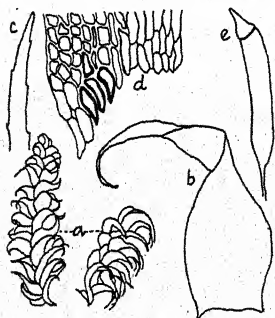


Figure 215

Fig. 215. Hypnum imponens Hedw. a, shoot from top (left) and from side (right); b, leaf; c, apex of leaf; d, alar cells; e, capsule. — Dioicous. Mostly very evenly pinnate, in broad sheets on soil, rocks or old wood, rich green, the leaves strongly falcate-secund. The alar cells and nearly erect capsules are characteristic. Queb. to B. C., Calif. and Ga. — H. fertile Sendt. has slightly different alar cells, curved capsule, and is monoicous. Nfd. to B. C., Tenn. and N. C.

226b Leaves 1 mm. long; quadrate alar cells very numerous, none inflated;

Fig. 216. .... H. reptile

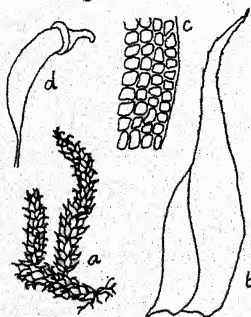


Figure 216

Fig. 216. Hypnum reptile Mx. a, shoot; b, leaf; c, alar cells; d, capsule. — Monoicous. A neat little moss, in dense mats on bark, stones or old wood; mesic. N. S. to Alaska, Ariz. and the mountains of North Carolina.

# HOW TO KNOW THE MOSSES

- 227a (b, c, d) Leaves squarrose-spreading, with tapered points.  
 Fig. 217. .... 228
- 227b Leaves complanate to falcate-secund. Figs. 218 - 220. .... 229
- 227c Leaves erect or appressed, broad and entire; capsule erect; cilia absent. Figs. 221 - 223. .... Genus Entodon .... 232
- 227d Leaves widely spreading, nearly orbicular, denticulate at apex; cilia present. Fig. 203. .... Hygrohypnum dilatatum .... See 215b
- 228a Leaves perfectly entire; in very wet places.  
 Fig. 217. .... Campylium polygamum

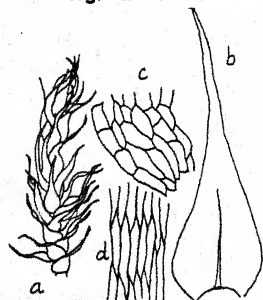


Figure 217

Fig. 217. Campylium polygamum (Bry. Eur.) Bryhn. a, shoot; b, leaf; c, alar region; d, median cells. — Arctic America to Calif. and Va. This, when the midrib is short, is hardly distinguishable from C. stellatum, 211b, when it has a single midrib. From Leptodictyum riparium, 175a, it differs by having the apical region of the leaf concave, and the base transversely attached to the stem.

- 228b Leaves finely denticulate; stem leaves much larger than branch leaves. Compare Fig. 220. .... Rytdiadelphus triquetrus, No. 125b, and R. squarrosus, .... No. 231b
- 229a Branches bent upward by reason of upwardly pointing falcate leaves; cilia lacking. Figs 218, 219 .... Genus Pylaisia .... 230
- 229b Leaves curved downward or backward.  
 Figs. 220; 207 - 216. .... 231
- 230a Inner peristome attached to outer; quadrate alar cells numerous (15-20 along margin of leaf). Fig. 218. .... P. Selwynii

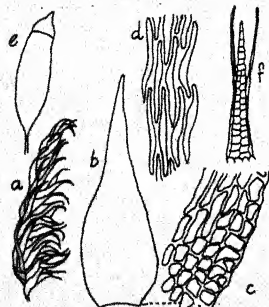


Figure 218

Fig. 218. Pylaisia Selwynii Kindb. a, shoot; b, leaf; c, alar region; d, median cells; e, capsule; f, teeth and segments of peristome. — In dense mats on trees, common east of the Rocky Mts. About the size of Platygyrium, much larger than Leskea. Capsules widest at the middle; teeth united with segments in lower half only; spores .018-.024 mm. P. intricata (Hedw.) Bry. Eur., N. B. to S. C., Ind. and Minn., has teeth and segments united completely; spores .024-.03 mm.

# HOW TO KNOW THE MOSSES

- 230b Inner peristome free from outer; quadrate alar cells 3 to 9 along margin of leaf. Fig. 219. .... P. polyantha

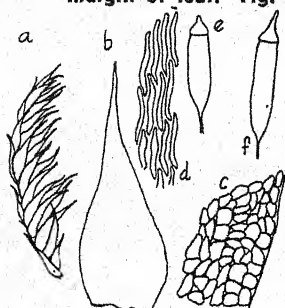


Figure 219

Fig. 219. Pylaisia polyantha Bry. Eur. a, shoot; b, leaf; c, alar region; d, median cells; e, capsule and operculum; f, capsule and operculum of P. subdenticulata. — In dense mats on trees; alar cells 3-9 on margin of leaf; spores .014 mm.; across the continent in Canada and extreme northern U. S. P. subdenticulata Schimp. has 10-15 marginal quadrate cells, spores .01-.012 mm., and occurs from N. Y. to Minn., N. Mex. and N. C.

- 231a Shoots flat, the leaves both complanate and falcate. .... Genus Hypnum .... See 218

- 231b Shoots essentially cylindric, but the large leaves falcate.

Fig. 220. .... Rhytidiadelphus loreus

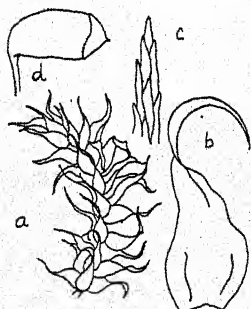


Figure 220

Fig. 220. Rhytidiadelphus loreus (Hedw.) Warnst. a, shoot; b, leaf; c, apex of leaf; d, capsule. — Big long irregularly branching plants, 10-20 cm. long, in large loose masses on soil, rocks and old wood, in moist spruce-fir forests, common from Oregon to Alaska; in the East, south to Ont., N. S. and Nfld. R. squarrosus (Hedw.) Warnst. is very similar, equally squarrose, not secund, and scarcely plicate, with numerous broad, colored alar cells; ocean to ocean in Canada, south to the mountains of Tenn.

- 232a Shoots julaceous to slightly flattened; peristome teeth with few and long joints. Fig. 221. .... E. seductrix

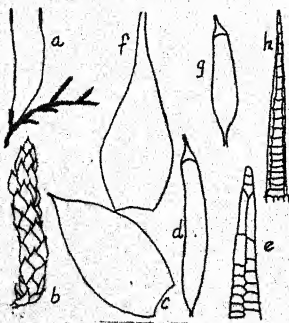


Figure 221

Fig. 221. Entodon seductrix (Hedw.) C. M. a, plant; b, shoot; c, leaf; d, capsule; e, peristome tooth; f, leaf; g, capsule; h, peristome tooth of E. brevisetus. — In dense mats on bark, earth or rocks, common from Ont. to Minn., Tex. and Fla.; rather variable. The peristome teeth are the most reliable marks of the species. E. brevisetus (H. & W.) J. & S. has leaves narrowly acuminate, and segments completely adherent to the closely-jointed teeth; N. B. to Va. and Mo.; rare.

## HOW TO KNOW THE MOSSES

- 232b Shoots decidedly flattened; joints of peristome teeth short and numerous. .... 233

- 233a Shoots 2-3 mm. wide; leaves 1.5 mm. long; teeth sculptured with wavy lines. Fig. 222. .... E. cladorrhizans

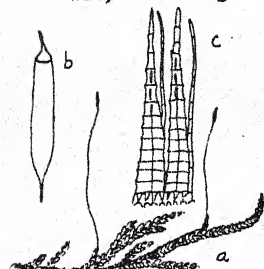


Figure 222

Fig. 222. Entodon cladorrhizans (Hedw.) C. M. a, shoot; b, capsule with operculum; c, teeth of peristome. — In large mats on bark, old logs or rocks, Minn. to Tex. and eastward. E. Drummondii (Bry. Eur.) J. & S. has a conspicuous yellow seta, that of the preceding species being red; on trees and logs, Tenn. and N. C. to the Gulf.

- 233b Shoots 1 mm. wide or less; leaves 1 mm. long; teeth densely papillose. Fig. 223. .... E. compressus

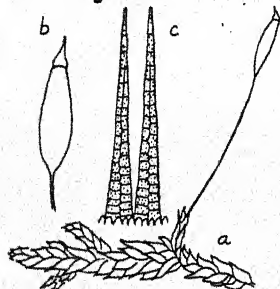


Figure 223

Fig. 223. Entodon compressus (Hedw.) C. M. a, shoot; b, capsule; c, teeth of peristome.— The dry shoots have the leaves sloping down from the stem like shingles from the comb of a roof. The peristome is the certain recognition character; on bark, old logs or earth, R. I. to S. Dak., Kan. and Ohio, "not common".

- 234a (b, c) Shoots complanate-foliate; leaves not falcate. Figs. 224 - 232. .... 235

- 234b Leaves falcate-secund, the branches hooked at tip. Fig. 220. .... Rhytidiadelphus loreus.....See 231b

- 234c Leaves erect-open. Try Hygrohypnum novae-caesareae. Fig. 204, No. 216a, or Plagiothecium Roeseanum. Fig. 224, No. 237a.

- 235a Leaves ovate to ovate-lanceolate; cells thin-walled, spindle-shaped. Figs. 224 - 229. .... Genus Plagiothecium .... 236

- 235b Leaves ovate to oblong; cells thick-walled, linear-flexuose. Figs. 230 - 232. .... Genus Neckera .... 241

- 236a Leaves decurrent on stem; plants relatively large. Figs. 224 - 226. .... 237



# HOW TO KNOW THE MOSSES

**236b** Leaves not decurrent; plants medium sized to small.

Fig. 227 - 229. .... 239

**237a** Leaves not truly complanate, but not quite equally spreading.

Fig. 224. .... P. Roeseanum

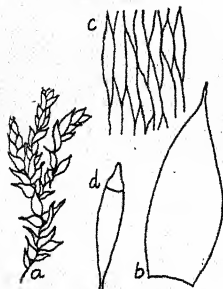


Figure 224

Fig. 224. Plagiothecium Roeseanum (Hampe) Bry. Eur. a, shoot; b, leaf; c, median cells; d, capsule. — Leaves and cells of Plagiothecium. In cushion-like mats on soil in shade. Midrib sometimes well developed. Canada to Ga. and Col. Only rarely fruiting.

**237b** Decidedly complanate. Figs. 225 - 226. .... 238

**238a** Shoots 3-4 mm. wide, whitish; leaves transversely rugose (wrinkled).

Fig. 225. .... P. undulatum

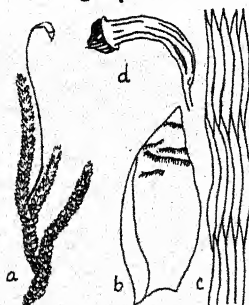


Figure 225

Fig. 225. Plagiothecium undulatum (Hedw.) Bry. Eur. a, shoot; b, leaf; c, median cells; d, capsule. — Much the largest of the genus; on moist soil or rocks, often mixed with other mosses; B. C. to Calif. Europe.

**238b** Narrower; green or yellowish; not rugose.

Fig. 226. .... P. denticulatum

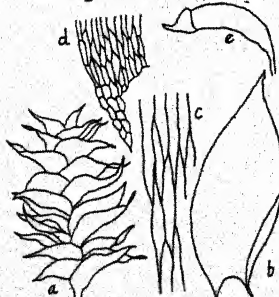


Figure 226

Fig. 226. Plagiothecium denticulatum (Hedw.) Bry. Eur. a, shoot; b, leaf; c, median cells; d, alar region; e, capsule. — Monoicous. In glossy-green mats on earth, stones or rotten wood in moist woodlands, Canada to Ga. and Col. — P. sylvaticum (Brid.) Bry. Eur. extends north to Alaska and south to Ala. It is more yellowish, and the leaves when dry do not overlap; dioicous.



# HOW TO KNOW THE MOSSES

- 239a Leaves obtuse at apex, yellowish, glossy, with short double midrib; serrate above. Fig. 227. .... P. geophilum

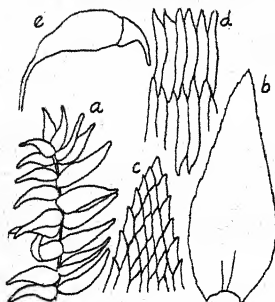


Figure 227

Fig. 227. Plagiothecium geophilum (Aust.) Grout. a, shoot; b, leaf; c, apex of leaf; d, median cells; e, capsule. — A very glossy yellowish moss, in thin mats on soil. Characterized by the luster and the blunt leaves, which are so far apart as hardly to touch one another. N. Y. to Ga., N. Mex. and Wis.

- 239b Leaves more or less longly acuminate. Figs. 228 - 229 ..... 240

- 240a Leaves distinctly serrulate from base to apex, crowded on the stem and overlapping. Fig. 228. .... P. deplanatum

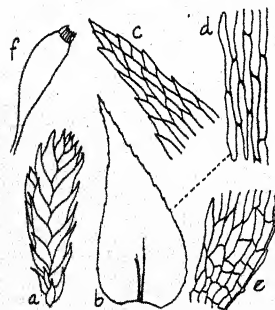


Figure 228

Fig. 228. Plagiothecium deplanatum (Sull.) Grout. a, shoot; b, leaf; c, apex of leaf; d, median cells; e, alar region; f, capsule. — Light green, very flat and close-leaved, the leaves overlapping, usually with long acuminate serrate apex. Sporophytes rare. On earth, stones and bark, N. S. to Minn., Ariz. and N. C.

- 240b Leaves serrulate near apex only. Fig. 229. .... P. micans

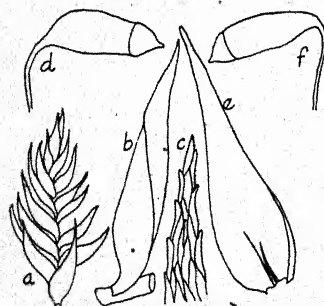


Figure 229

Fig. 229. Plagiothecium micans (Sw.) Paris. a, shoot; b, leaf; c, apex of leaf; d, capsule with operculum; e, leaf, and f, capsule of P. elegans (Hook.) Sull. — The first is monoicous, and occurs on soil, old wood or bark, N. Y. to Mo. and the Gulf. The second is dioicous, and often bears branchlike gemmae in the axils of the leaves, N. C. and Calif. and northward.

# HOW TO KNOW THE MOSSES

- 241a Midrib reaching middle of leaf or beyond; branches tapering to a point; with abundant lanceolate paraphyllia. Fig. 230. .... N. Menziesii

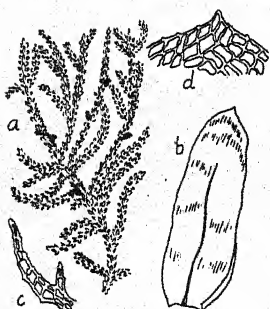


Figure 230

Fig. 230. Neckera Menziesii Hook. a, shoot with capsules; b, leaf; c, paraphyllium; d, apex of leaf. — A big glossy moss, 10-20 cm. long, in loose masses on trees and rocks, Calif. to Mont. and Alaska. Peristome segments well-developed.

- 241b Without midrib or paraphyllia; leaves wrinkled (undulate). .... 242

- 242a Leaves entire or slightly denticulate above; eastern U. S.

Fig. 231. .... N. pennata

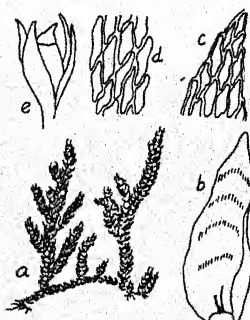


figure 231

Fig. 231. Neckera pennata Hedw. a, shoot; b, leaf; c, apex of leaf; d, median cells; e, capsule. — Shoots or mats hanging on bark of trees, very flat. Perianth segments short and imperfect. Ont. to N. C. and west to about the 100th meridian.

- 242b Leaves with numerous slender sharp teeth above; western.

Fig. 232. .... N. Douglasii

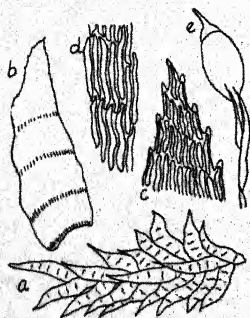


Figure 232

Fig. 232. Neckera Douglasii Hook. a, shoot; b, leaf; c, apex of leaf; d, median cells; e, capsule. — Characterized by the big sharp teeth of the leaf. Segments slender, about as long as the teeth. On rocks and trees, Calif. to Alaska, Col. and Idaho.

# PICTURED-KEY

## TO LIVERWORTS OF NORTH AMERICA

- 1a Plants growing flat, scale-like or ribbon-like, usually fork-branched, without distinction of stem and leaf, green or purplish. ✓  
Figs. 233 - 295. Class 2. Hepaticae (in part) ..... 2
- 1b Plants with stem and leaves; erect, ascending, prostrate, or hanging from trees. .... 3
- 2a Plant opaque by reason of air-spaces inside of it, often showing air-pores and polygonal markings. Rhizoids with pegs on the inside of the walls. Figs. 236 - 245. .... 6
- 2b Plant translucent, watery-looking, without inner air-spaces. Rhizoids without pegs. Figs. 233-235; 246-251.  
Class Hepaticae (in part) ..... 4
- 3a Leaves in 2 rows near upper side of stem, without midrib, and with cells isodiametric. Leaves very often notched at apex, or lobed, sometimes with a smaller lobe folded against a larger one. Sporophyte short-lived. Figs. 252 - 295. Order Jungermanniales ..... 18
- 3b Leaves equally spaced all around the stem, usually with midrib; margins entire or toothed, never notched at apex or lobed; cells elongate to isodiametric. Sporophyte persisting for weeks or months. Figs. 24 - 232.  
Class 1. Musci.
- 4a (b, c) Small rosettes or scales, with surface covered with pear-shaped sacs (involucre) each containing a capsule. No elaters. Fig. 233.  
Order Sphaerocarpaceae, Family Sphaerocarpaceae, Genus Sphaerocarpus.

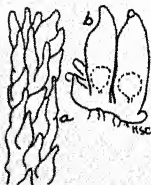


Figure 233

Fig. 233. Sphaerocarpus texanus Aust. a, male plant; b, female plant. — The plants of this family and order are quite small and are found on damp ground. The species name of this one was given because the type specimen came from Texas. Four other species occur in the southern U. S.

# HOW TO KNOW THE MOSSES

4b Larger (1 cm. or longer at maturity). Spores in a long rod-like capsule which splits in two above as it grows up from the base, emitting spores and irregular elaters. No midrib and no gemmae, but sometimes the plant is rough. One large chloroplast in each cell. Figs. 234-235. Class 3 Anthocerotae, Order Anthocerotales, Family Anthocerotaceae. 5

4c Spores in an oval or globular capsule on a slender watery stalk. Capsule splitting into four lobes, emitting spores and spiral-banded elaters. Midrib or mid-furrow usually distinct. Chloroplasts numerous in each cell. Order Metzgeriales Figs. 246-251. ....14

5a Capsule erect, 1-3 cm. long, becoming black after splitting. Fig. 234. ....Genus Anthoceros

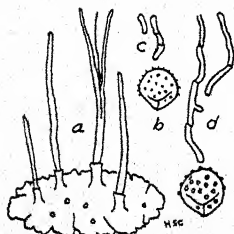


Figure 234

Fig. 234. Anthoceros laevis L., a, plant; b, spore; c, elaters; d, spore and elaters of A. fusiformis. — The first is found across the continent; the second is only in our northwest, Ore., Wash., Idaho, B. C. The first has yellow spores, the other black. Capsules of A. fusiformis are up to 4 cm. tall; it looks like a tuft of burned grass.

5b Capsules horizontal, short, slightly projecting from the margins of the thallus, Fig. 235. ....Genus Notothylas

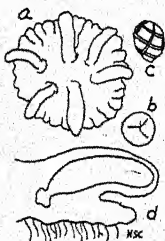


Figure 235

Fig. 235. Notothylas orbicularis (Schwein.) Sull. a, plant; b, spore; c, elater; d, section of sporophyte in perianth. — The rosettes, to 1 cm. in diameter, grow on damp, firm soil, clay or silt, in shade, N. E. to N. C., Wis., Nebr., and Tex. Though rarely collected the species is probably everywhere.

6a (b, c) Air pores visible without a lens, each in a polygonal area. Capsules borne on the under side of an umbrella-shaped receptacle, with spirally banded elaters among the spores. Wall cells of capsules with ring-shaped thickenings.

Figs. 236 - 239. ....Family Marchantiaceae ..... 7

6b Air pores not visible without a strong lens. Plants on moist or dry rocks or banks, rarely, if ever, in neat rosettes. Capsules as in 6a, but with no ring-like thickenings.

Figs. 240 - 242. ....Family Rebouliaaceae .....10

## HOW TO KNOW THE MOSSES

- 6c Air pores, if any, not visible with a hand lens. Plants submerged or floating, or in circular rosettes on very wet ground. Capsules imbedded in the plant, with no elaters among the rough spores.

Figs. 243 - 245. ....Family Ricciaceae.....12

- 7a With open cups or half-cups of disc-shaped gemmae on the thallus; archegonia (and sporophytes) on the under side of long-fingered umbrellas with 4 to 9 fingers. Figs. 236 - 237. .... 8

- 7b Without gemmae, and without marginal scales on under side of thallus. Figs. 238 - 239. .... 9

- 8a Gemma cups round, fringed; female umbrellas 9-lobed; thallus with thin scales along the margins beneath; air pores elliptic.

Fig. 236. ....Genus Marchantia

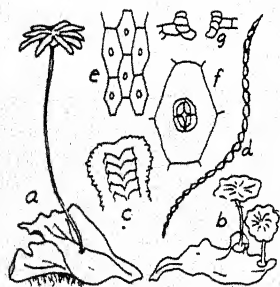


Figure 236

Fig. 236. Marchantia polymorpha L. a, female plant; b, male plant; c, scales on under side of thallus; d, elater; e, surface of thallus; f, pore; g, section of pore. — All over N. America and Europe, on freshly disturbed clayey or silty soil, especially on burned places. Spores yellow. The umbrella-like female receptacles grow to full size even if not one egg is fertilized. The golden yellow sporophytes are found under the umbrellas in late June in Iowa. Two other species occur in the South.

- 8b Gemmae in half-cups; female umbrella 4-lobed; thallus without marginal scales beneath; found only in greenhouses and sterile, except in S. California. Fig. 237. ....Genus Lunularia

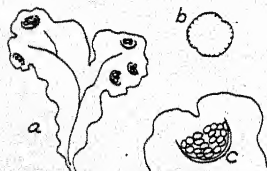


Figure 237

Fig. 237. Lunularia cruciata (L.) Dum. a, plant; b, gemma; c, gemma cup. — Introduced from Europe; common in greenhouses from Iowa to the Atlantic coast.



## HOW TO KNOW THE MOSSES

- 9a Air pore on a low mound of colorless cells; antheridia in a warty spot on the thallus; sporophytes beneath a cone-shaped umbrella.

Fig. 238. .... Genus Conocephalum

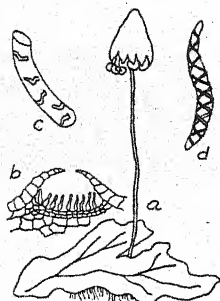


Figure 238

Fig. 238. Conocephalum conicum (L.) Dum. a, plant; b, section of pore; c, rhizoid with pegs; d, elater. — The largest of our thalloid liverworts, very common on moist earth or rocks, often covering many square feet. The conical umbrella is only raised up on its stalk in spring when the spores are ripe. It is watery and short-lived, maturing in late April or May in Iowa. N. America and Europe. Emits an aromatic odor when bruised.

- 9b Air pores circular, surrounded by a low cylinder of cells; antheridia and sporophytes on upraised scalloped umbrellas.

Fig. 239. .... Genus Preissia

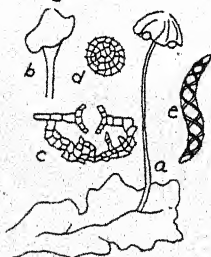


Figure 239

Fig. 239. Preissia quadrata (Scop.) Nees. a, plant with capsules; b, antheridial receptacle; c, section of pore; d, spore; e, elater. — Northern U. S., N. J., Ky., Iowa, Colo., Ore., to Alaska and Greenland; Europe, Asia. Thalli 3-4 cm. long, 1 cm. wide or less, often purplish, often in extensive sods on moist earth or rocks. Spores umber-brown, ripe in May in Iowa, in July in Colorado at 8000 ft. elev.

- 10a Cells of the epidermis with thin walls with or without prominent trigones; .025-.03x.04-.05 mm. Figs. 241-242. .... 11

- 10b Cells of epidermis with the walls thickened all round, and at the corners, .014x.017 mm.; cells around the pores in 2-3 radiating rows; stalk of umbrella with broad (4-8 cells wide) white scales around base and summit. Fig. 240. .... Genus Mannia

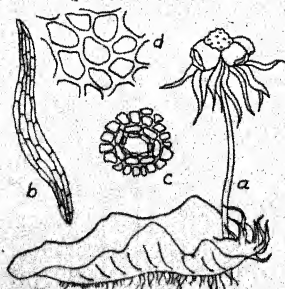


Figure 240

Fig. 240. Mannia fragrans (Balb.) Frye and Clark. a, plant; b, scale; c, pore; d, cells of epidermis. — Thalli 2-4 mm. wide, curling up at the edges when dry, completely covering the upper surface, exposing the deep-purple under side. On dry stony soil and rocks, Greenland to Ala., Tex., Nebr. and Minn. Sporophytes in May in Iowa. A very similar species in Ariz. and Cal. is M. californica (Gottsche) Wheeler.



## HOW TO KNOW THE MOSSES

- 11a Cells around the pores in 4 or 5 radiating rows, the walls thickened; capsule embraced in a 2-lipped involucre; stalk of umbrella with hair-like scales (2-4 cells wide) at summit. Fig. 241. .... Genus Reboulia

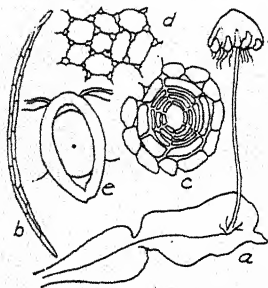


Figure 241

Fig. 241. Reboulia hemisphaerica (L.) G. L. & N. a, plant; b, scale from upper end of stalk of receptacle; c, pore; d, cells of epidermis; e, involucre. — Purplish on the margin but drying nearly flat; 6-7 mm. wide; in small groups on soil or rocks. Sporophytes in mid-May in Iowa. Maine to Wash. and S. America; Europe; Asia, East Indies, Australia. The only species.

- 11b Cells around the pores irregular, thin-walled; stalk of umbrella naked at both ends; capsule surrounded by several scales, remnants of a tubular pseudo-perianth. Fig. 242. .... Genus Asterella

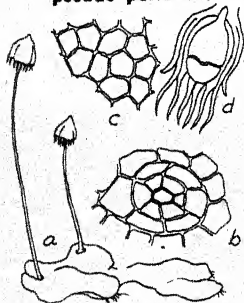


Figure 242

Fig. 242. Asterella tenella (L.) Beauv. a, plant; b, pore; c, cells of epidermis; d, sporophyte and pseudoperianth. — Slender, 1.5-3 mm. wide, with a rounded ventral keel. Spores .08-.09 mm. with netted surface. On moist soil, Maine to Ga., Tex., Mo. and Ill. A. Ludwigii (Schw.) Underw. is similar, Cal. to Alaska, N. Y., Greenland, Iceland, Europe. Six other species occur in N. America.

- 12a Lobes of the thallus 5-10 mm. wide, with air spaces in 3 or 4 irregular layers; in rosettes 2-3 cm. across on muddy shores, or floating in triangular pieces bearing many thin scales beneath. Fig. 243. .... Genus Ricciocarpus

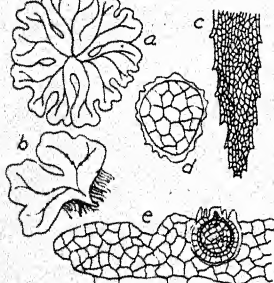


Figure 243

Fig. 243. Ricciocarpus natans (L.) Corda. a, land form; b, floating form; c, ventral scale; d, spore; e, section of thallus and sporophyte. — The floating form bears capsules in April in north central states; the land form is very fertile in Louisiana in November. Common: Maine to Fla., Tex. and Minn. Europe, Asia, Australia, S. America, West Indies.

## HOW TO KNOW THE MOSSES

- 12b Lobes 3 mm. to 1 mm. wide, with air chambers in 1 or 2 layers, or with mere chinks between the chains of upper cells.

Figs. 244, 245. . . . . Genus Riccia . . . . . 13

- 13a In rosettes on earth, in gardens, fields or on river banks. Lobes 1 to 3 mm. wide. Fig. 244. . . . . R. Frostii

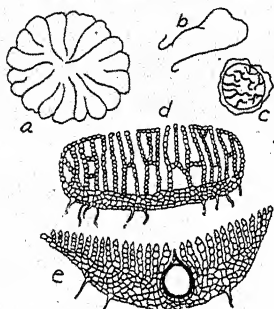


Figure 244

Fig. 244. Riccia Frostii Aust. a, plant; b, lobe enlarged, with capsule; c, spore; d, section of thallus; e, section of thallus of R. glauca. — Common and widespread; there are 14 species in N. America with thallus like R. glauca, and 6 with air chambers as in R. Frostii. Several in each group are of world-wide distribution. They are difficult to identify with certainty. Capsules are ripe in autumn.

- 13b Floating branching ribbons, 1 mm. wide, often in tangled masses.

Fig. 245. . . . . R. fluitans

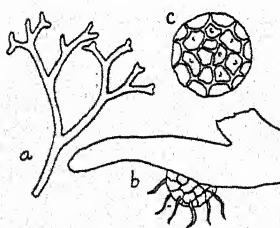


Figure 245

Fig. 245. Riccia fluitans L. a, plant; b, plant with capsule bulging out beneath; c, spore. — In shallow water, Queb. to Mont., B. C., Calif., Mex., Fla., W. I., S. Amer., Europe, Asia, Africa, East Indies, Samoa, N. Z. At sea level on Long Island, N. Y., and 7500 ft. in Yellowstone Park. Fruits are rare; of 27 specimens in my herbarium only one has capsules; it was collected in late October near Washington, D. C.

- 14a (b, c) Plant deeply cut on both sides of a stem-like midrib into ruffled, leaf-like lobes.

Fig. 246. Family Fossombroniaceae. . . . . Genus Fossombronia

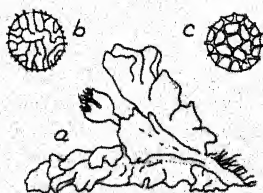


Figure 246

Fig. 246. Fossombronia Wondraczekii (Corda.) Dum. a, plant; b, spore; c, spore of F. foveolata Lindb. — Eleven species are known from North America. The name of the first one here illustrates the international aspect of Science! The species is known from Europe, Asia and Africa, as well as from the eastern U. S.

## HOW TO KNOW THE MOSSES

- 14b Plant with shallow marginal lobes, with lumps of blue-green algae imbedded here and there, and with bottle-shaped gemma-containers; or tiny star-shaped gemmae.

Fig. 247. .... Family Blasiaceae, Genus Blasia

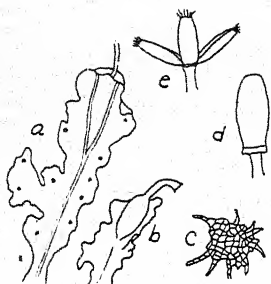


Figure 247

Fig. 247. Blasia pusilla (Mich.) L. a, plant; b, gemma-bottle; c, star-shaped gemma; d, capsule; e, opened capsule. — Often in sods covering many square feet of freshly exposed damp clay. Capsules ripen in late April in Iowa. Greenland to Alaska, Penn., Iowa, N. Mex., Cal., Europe, Asia, Australia.

- 14c Margins of plant even, or wavy but not regularly lobed. The plant itself may be variously lobed or branched.

Figs. 248 - 251. .... 15

- 15a Midrib well defined, bulging like a cord along lower side of plant, the rest of the thallus only 1 cell thick.

Figs. 248 - 249. .... 16

- 15b Midrib ill defined, merely the gradually thickened central part of the plant, which is 1 cell thick only at the extreme margin if at all.

Figs. 250 - 251. .... 17

- 16a Plant 1 to 2 mm. wide, much longer than wide, of very even width, forking. Sex organs underneath. On trees, leaves or damp ground.

Fig. 248. .... Family Metzgeriaceae, Genus Metzgeria

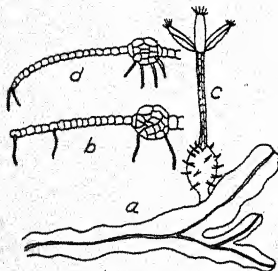


Figure 248

Fig. 248. Metzgeria furcata (L) Dum. a, plant; b, cross section of thallus; c, involucre, seta, open capsule with elaters; d, section of thallus of M. conjugata Lindb. — Both of these, the first 1 mm. wide, the second 2 mm. wide, have worldwide distribution. Six other species are almost as far spread, but not so commonly seen.

- 16b Plant 3 to 4 mm. wide, often very irregularly lobed; sex organs on upper side, along midrib. On wet peaty ground.

Fig. 249. . . . . Family Pallaviciniaceae, Genus Pallavicinia

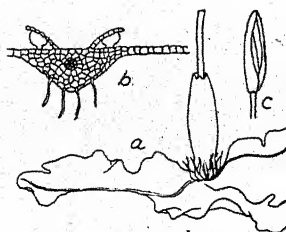


Figure 249

Fig. 249. Pallavicinia Leyellii (Hook.) S. F. Gray. a, plant; b, section of antheridial shoot; c, capsule. — Thallus 4-5 mm. wide, with a central strand of small cells in the midrib. Worldwide. Moerckia flotowiana (Nees) Schiffn. inhabits northern North America and Europe. The thallus lacks the central strand in the midrib, and the sporangium is thicker walled; otherwise like Pallavicinia. Two other species of Moerckia occur in N. America.

- 17a Plant 4 to 16 mm. wide, usually crowded in wide (10-50 cm.) patches on moist shaded ground. Elaters attached at base of capsule.

Fig. 250. . . . . Family Pelliaceae, Genus Pellia

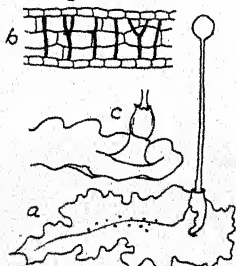


Figure 250

Fig. 250. Pellia epiphylla (L) Corda. a, plant; b, section of thallus with thickened bands; c, fruiting tip of P. Neesiana (Gottsche) Limpr. showing cylindric involucre. P. Fabroniana lacks the thickened bands, but has the cylindric involucre. All three are circumboreal, south to N. C. and Tex., apparently avoiding lime. P. epiphylla is the most common.

- 17b Plant 1-5 mm. wide, variously lobed or branched, in very wet places or in shallow water. Elaters attached to apex of capsule (tips of valves).

Fig. 251. . . . . Family Riccardiaceae, Genus Riccardia

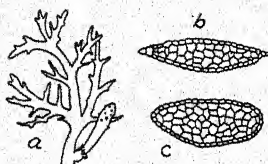


Figure 251

Fig. 251. Riccardia multifida (L) S. F. Gray. a, plant; b, cross section of thallus; c, section of thallus of R. palmata (Hedw.) Carr. Little branchy thalli, among other mosses or in crowds, in water or very wet places. Rarely found in fruit. R. pinguis (L) S. F. Gray is 2-10 mm. wide. All of our 5 species are of circumboreal or worldwide distribution.

- 18a Leaves deeply divided into many threads or rows of cells.

Figs. 252 - 255. . . . . 19

- 18b Leaves entire, or toothed, or divided at tip into 2, 3 or 4 lobes.

Figs. 256 - 295. . . . . 22

# HOW TO KNOW THE MOSSES

19a Basal part of leaf showing 2 major lobes, each 6-20 cells wide.

Fig. 252. .... Genus Ptilidium

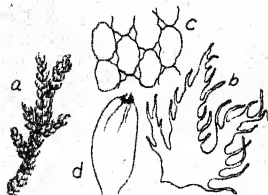


Figure 252

Fig. 252. Ptilidium pulcherrimum (Web.) Hampe. a, plant; b, leaf; c, cells of leaf; d, perianth. — Creeping over rotten wood, often amongst other mosses; often purplish brown. P. ciliare (L.) Nees has wider leaf-lobes, 15 to 20 cells at base of lobe, against 6 to 10 cells for the preceding species; it is more upright, in deep tufts. Both of these are circumboreal, south to Penna. and Ill. P. californicum (Aust.) M. & C., with only 3 to 12 hair-tipped divisions per leaf, ranges from Cal. to Idaho and Alaska.

19b Basal part of leaf 1-4 cells wide. Figs. 253 - 255. .... 20

20a Plant large (covering 2 to 55 cm. or more); leaves much divided into very many filiform divisions.

Fig. 253. .... Genus Trichocolea

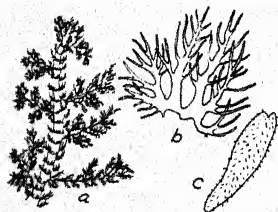


Figure 253

Fig. 253. Trichocolea tomentella (Ehrh.) Dum. a, plant; b, leaf; c, perianth. — Stems hairy; underleaves similar to upper leaves. In beautiful pale green or yellowish mats on wet ground. Nfd. to Va., Tenn. and Wis. Europe, Asia, Samoa, Tahiti!

20b Small slender plants; leaves with 2-4 filamentous divisions.

Figs. 254 - 255. .... 21

21a Basal part of divisions 2 cells wide.

Fig. 254. .... Genus Microlepidozia

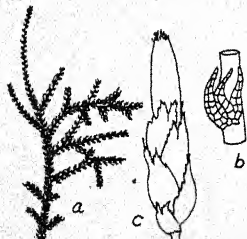


Figure 254

Fig. 254. Microlepidozia sylvatica (Evans) Joerg. a, plant; b, leaf; c, perianth. — Minute films on peaty soil in woods; N. E. to Fla. M. setacea (Web.) Mitt., with leaves 4-parted, is found in northeastern U. S., Europe and Asia.



# HOW TO KNOW THE MOSSES

21b Basal part of divisions only 1 cell wide.

Fig. 255. .... Genus Blepharostoma

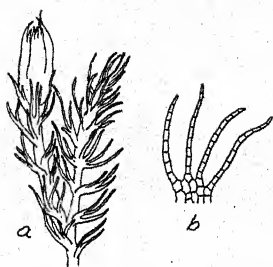


Figure 255

Fig. 255. Blepharostoma trichophyllum (L) Dumort. a, plant; b, leaf. — Fine threads on peaty, mossy ground, moist and shady. Frequently fruiting. Greenland to Alaska, N. J., Iowa, Colo. (to 10,000 ft. alt.) and Cal.; Europe; Asia.

22a Leaves flat or curved, not sharply folded. Figs. 256 - 281. .... 23

22b Leaves two-lobed and folded, one lobe pressed firmly against the other. Figs. 282 - 295. .... 47

23a Leaves incubous: attached obliquely to the stem so that the edge of leaf on upper surface of stem is attached nearer the apex of the stem than the lower edge; thus the leaf slopes toward the base of the stem. Figs. 256 - 258. .... 24

23b Leaves transversely attached, or succubous: attached obliquely so that the edge of the leaf on upper surface of stem is attached nearer the base of the stem than the lower edge; thus the leaf slopes toward the apex of the stem. Figs. 259 - 281. .... 26

24a Leaves divided half way or more into 3-6 lobes.

Fig. 256. .... Genus Lepidozia



Figure 256

Fig. 256. Lepidozia reptans (L) Dum. a, plant; b, leaves and underleaves; c, perianth. — Pale filmy growths on shaded, damp sandy soil or rocks, frequent. Nfd. to Alaska, Cal., Mex. and N. C. Europe. Three other species are reported from N. America.

24b Leaves entire or notched, not divided half way.

Figs. 257 - 258. .... 25



# HOW TO KNOW THE MOSSES

## 25a Leaves 3-toothed at apex, firm, green or brown.

Fig. 257. . . . . Genus Bazzania

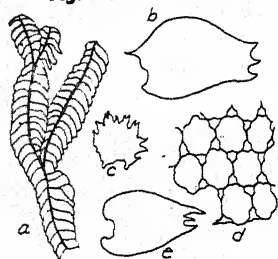


Figure 257

Fig. 257. Bazzania trilobata (L.) S. F. Gray. a, plant; b, leaf; c, underleaf; d, cells of leaf; e, leaf of B. tricrenata. Common on moist shaded logs or rocks, often in patches 2 ft. across. The leaves bend down when dry; very rarely fruiting. East of the 95th meridian. Europe. In Washington State B. tricrenata (Wahl.) Pearson, Fig. 257, e, is frequent. Five other species are recorded for N. America.

## 25b Leaves entire or 2-toothed, pale and watery; cells large (.03-.055 mm.).

Fig. 258. . . . . Genus Calypogeia

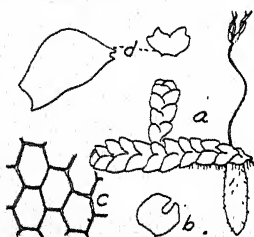


Figure 258

Fig. 258. Calypogeia Trichomanis (L.) Corda. a, plant; b, underleaf; c, cells of leaf; d, leaf and underleaf of C. fissa (L.) Raddi. — Shoots very flat, on damp peaty soil or rotten wood, often among other mosses. The curious subterranean "perigynium" from which the sporophyte emerges is unique; found in spring. Pretty much all over this continent and Europe. The species merge into one another, and are hardly distinguishable.

## 26a Leaves entire, not at all lobed or toothed (bracts around the perianth are excluded). Figs. 259 - 263. . . . . 27

## 26b Leaves 2- or more lobed, or toothed on the margin. Figs. 264 - 281. . . . . 31

## 27a (b, c) Perianth triangular, split in three at the top, overtopped by the larger, obovate calyptra (archegonium) when sporophyte emerges, borne on a short branch; underleaves present, conspicuous, 2-lobed; antheridia in axils of leaves in groups along the stem.

Fig. 259. . . . . Genus Chiloscyphus

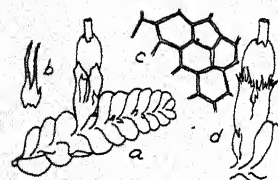


Figure 259

Fig. 259. Chiloscyphus polyanthus (L.) Corda. a, plant; b, underleaf; c, cells of leaf; d, perianth and calyptra of C. pallescens (Ehrh.) Dum. — One of our largest liverworts, often in beds several inches across on moist shaded banks; margin of leaf often concave at apex. Sporophytes in early May in Iowa. Labr. to Alaska, N. C., Mo. and Cal. Europe. C. pallescens is paler, and in wetter places, Quebec to B. C., N. C., N. Mex. and Oregon. Europe. Three other species are recorded for N. America.

# HOW TO KNOW THE MOSSES

- 27b Similar to the above, but calyptra remaining deep within the perianth, which terminates a main shoot; antheridia just below the perianth.

Fig. 267. .... Lophocolea heterophylla, No. 34a.

- 27c Underleaves absent or minute and lanceolate.

Figs. 260 - 263. .... 28

- 28a Branches from under side of stem; leaves circular, rather rigid, tending to stand on edge facing one another; dioicous; antheridia on short branches. Fig. 260. .... Genus Odontoschisma

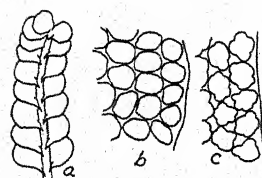


Figure 260

Fig. 260. Odontoschisma prostratum (Sw.) Trevis. a, plant; b, cells of leaf; c, cells of O. denudatum (Mart.) Dum. — Common on damp peaty soil; often bearing slender leafless branches (flagella); perianth on a short branch, but rarely seen. N. E. to Ohio and South America. O. denudatum extends from Fla. and Ala. to Greenland, Iceland and Europe. Compare Jamesoniella, No. 29a.

- 28b Branches axillary; leaves cordate to oblong, lying flat when wet; cell walls thin all around; antheridia grouped along the main stem, or on a branch. Figs. 261 - 263. .... 29

- 29a Mouth of perianth contracted, and fringed with many-celled hairs.

Fig. 261. .... Genus Jamesoniella

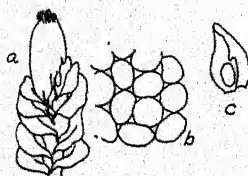


Figure 261

Fig. 261. Jamesoniella autumnalis (DC) Steph. a, plant with perianth and bracts; b, cells of leaf; c, leaf that bears an antheridium. — Common on moist sandstone or earth, usually with other mosses, Greenland to B. C., Wash., Mo. and Ala. Europe. Dioicous. Antheridia at the end of a special shoot, in 4-6 pairs of bracts, each bract with 1 or 2 teeth on the upper margin. Perianth on the end of a main shoot. These characters will distinguish this from Odontoschisma or Chiloscyphus. Sporophytes in September.

- 29b Mouth of perianth plaited but not fringed.

Figs. 262 - 263. .... Genus Jungermannia .... 30

## HOW TO KNOW THE MOSSES

- 30a Leaves broadly cordate; cell walls thin, without trigones; perianth slender, spindle-shaped. Fig. 262. .... *J. cordifolia*

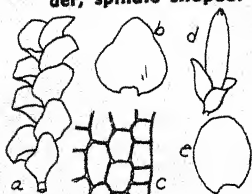


Figure 262

Fig. 262. *Jungermannia cordifolia* Hook. a, plant; b, leaf; c, cells of leaf; d, perianth; e, leaf of *J. pumila* With. — Tiny green films on moist sandstone or wet soil, Greenland to Alaska, Cal., Wis. and N. Y. Iceland, Europe, Asia, S. America. *J. pumila* is larger, about 1 mm. wide; similar range.

- 30b Leaves oblong-rectangular; trigones distinct, bulging into the cells; perianth cylindric, nearly flat across the top, with a short tubular mouth. Fig. 263. .... *J. lanceolata*

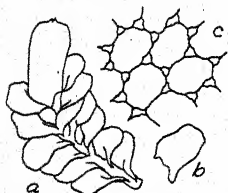


Figure 263

Fig. 263. *Jungermannia lanceolata* D. a, plant; b, leaf; c, cells of leaf. — In thin mats among mosses. Stems to 3 cm. long; cells .03-.048 mm. Monoicous; antheridia just below the perianth. Labr. to Alaska, Wash. and N. C. Europe, Asia. Twelve species of *Jungermannia* are now recognized in North America. Formerly this genus included nearly all of the leafy liverworts.

- 31a Leaves toothed, at least on the distal margin (or entire!); margin turned back near base of leaf on upper side of stem; large plants. Figs. 264-265. .... Family Plagiochilaceae, Genus Plagiochila .... 32

- 31b Margins not toothed, but the leaf 2-4 lobed. Figs. 266-281. .... 33

- 32a Teeth of leaf more than 10, small to obsolete; leaves broadly ovate. Fig. 264. .... *P. asplenioides*

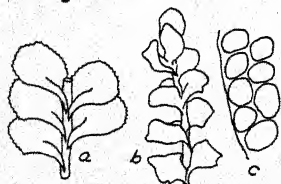


Figure 264

Fig. 264. *Plagiochila asplenioides* (L) Dum. a, wet shoot; b, dry shoot; c, cells of leaf. — Variable as to size, up to 4 or 5 mm. wide, yellowish green, in peculiar pleated sods, or among other mosses. Rarely fruiting. Leaves usually entire in Mid-west; U. S. and Canada; Mex.; Europe. Common.

- 32b Teeth fewer than 10, large and several-celled; leaves narrowly ovate. Fig. 265. .... *P. Sullivantii*

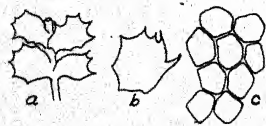


Figure 265

Fig. 265. *Plagiochila Sullivantii* Gottsche. a, shoot; b, leaf; c, cells of leaf. — There are several of these spinose species, varying to simply bi-lobed leaves. This one is found from N. H. to Fla. and Tenn. A large genus in the tropics.

## HOW TO KNOW THE MOSSES

- 33a (b, c) Underleaves easily found, split nearly to the base; perianth 3-angled, at the end of a main shoot, with 3 fringed lobes.  
Figs. 267 - 268. .... Genus Lophocolea ..... 34

- 33b Underleaves easily found, lanceolate, Fig. 266. .... Genus Harpanthus

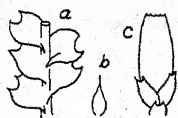


Figure 266

Fig. 266. Harpanthus scutatus (W. & M.) Spruce. a, shoot; b, underleaf; c, perianth. — Pale, close to the substrate, often mistaken for the next. On damp ground or rotten wood, Labrador to B. C., Wis., Tenn. and N. C. Europe.

- 33c Underleaves small or absent. Figs. 269-281. .... 35

- 34a Leaves broadest at middle or distal end, with 2 short acute lobes, or emarginate or entire. Figs. 267. .... L. heterophylla

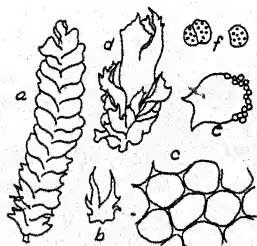


Figure 267

Fig. 267. Lophocolea heterophylla (Schrad.) Dum. a, plant; b, underleaf; c, cells of leaf; d, perianth; e, leaf of L. minor Nees, with gemmae; f, gemmae. — Common on shaded banks or rotten wood, U. S. and southern Canada; Europe. Perianths mature in autumn; sporophytes come up in spring or in January in the laboratory. L. minor is about half as large as the former species.

- 34b Leaves broadest at base, divided into two long-acuminate lobes.

- Fig. 268. .... L. bidentata

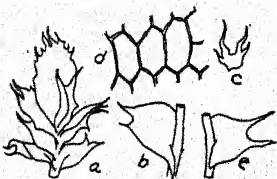


Figure 268

Fig. 268. Lophocolea bidentata (L.) Dum. a, shoot; b, leaf; c, underleaf; d, cells of leaf; e, leaf of L. cuspidata Limpr. — The first is dioicous and rarely fruits; the second is monoicous and usually has perianths; otherwise they are very much alike. On moist earth, old logs and stumps, over most of N. America and Europe.

- 35a (b, c, d) Leaves broad, with 3 or 4 large triangular lobes.

- Figs. 271 - 274. .... 36

## HOW TO KNOW THE MOSSES

- 35b Leaves with 3 (-2) very unequal lobes, one margin much longer and more convex than the other. Fig. 269. .... Genus Tritomaria



Figure 269

Fig. 269. Tritomaria exsecta (Schmid.) Schiffn. a, shoot; b, leaf; c, gemma; d, gemmae of T. exsectiformis (Bridl.) Schiffn.; e, leaf of T. quinquedentata (Huds.) Buch. — The first two are small, erect plants, 5-10 mm. tall, the gemmae reddish; the second has cells .022-.024 mm. across, the first .010-.017 mm. The third is larger, stems 2-5 cm. long; gemmae 2-celled, angular. Northern U. S. (N. C., Tenn., Iowa) to Alaska. Europe.

- 35c Leaves two-lobed. Figs. 275 - 281. .... 39

- 35d Leaves entire or broadly and shallowly emarginate; perianth united at base with neighboring leaves. Fig. 270. .... Genus Plectocolea

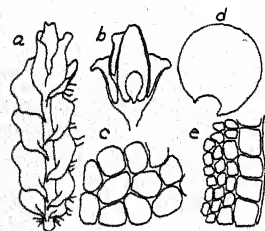


Figure 270

Fig. 270. Plectocolea hyalina (Lyeil) Mitt. a, shoot with perianth; b, section of perianth; c, cells of leaf; d, leaf of P. crenulata; e, marginal cells of same. — On moist soil or rocks, often covering a foot of surface in pure stand. Dioicous. Sporophytes in April in Iowa. U. S. east of Rocky Mts. Mexico. Europe. P. rubra (Gottsche) Evans is the usual form on our northwest coast.

- 36a Leaves flat when wet; lobes usually obtuse; lower margin of leaf without hairlike appendages (cilia).

- Fig. 271. .... Barbilophozia barbata

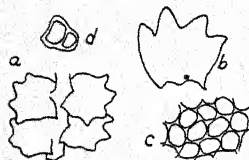


Figure 271

Fig. 271. Barbilophozia barbata (Schmid.) Loeske. a, shoot; b, leaf; c, cells of leaf; d, gemma. — A large liverwort, on moist rocks and banks, across the continent northward: Mich., Colo., Wash., and in Europe. Underleaves usually absent.

- 36b Lower margin of leaf with 2-4 cilia; leaves wrinkled; lobes acuminate; underleaves present, cleft in two, ciliate-margined.

- Figs. 272 - 274. .... 37



# HOW TO KNOW THE MOSSES

## 37a Cells of cilia much longer than broad.

Fig. 272. .... Barbilophozia Hatcheri

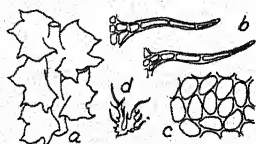


Figure 272

Fig. 272. Barbilophozia Hatcheri (Evans) Loeske. a, shoot; b, cilia; c, cells of leaf; d, underleaf. — Large species of our northwest. B. lycopodioides (Wallr.) Cogn. has leaves 4-5-lobed, with shorter lobes, and rarely with gemmae. Both are found also in Europe.

## 37b Cells of cilia about as broad as long.

Figs. 273 - 274. .... Genus Orthocaulis. .... 38

## 38a Leaves 3-lobed about 1/3 of length. Fig. 273. .... O. Floerkei

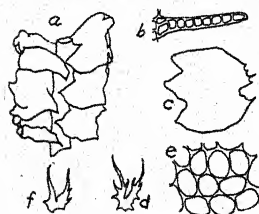


Figure 273

Fig. 273. Orthocaulis Floerkei (W. & M.) Buch. a, shoot; b, cilium; c, leaf; d, underleaf; e, cells of leaf; f, underleaf of O. Kunzeanus (Huben.) Buch. — Large species of northern distribution. Europe. This, with the preceding number and the following are called Lophozia in all of the older texts.

## 38b Leaves 4-lobed about 1/2 of length. Fig. 274. .... O. quadrilobus



Figure 274

Fig. 274. Orthocaulis quadrilobus (Lindb.) Buch. — a, leaf; b, cilium; c, underleaf. Gemmae rare, variously shaped. Arctic-alpine. Europe.

## 39a Leaves with long-acuminate lobes, the lower margin rolled over to form a sac; very slender plants; Fig. 275. .... Genus Nowellia

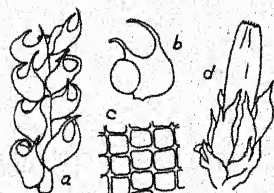


Figure 275

Fig. 27. Nowellia curvifolia (Dicks.) Mitt. a, shoot; b, leaf; c, cells of leaf; d, perianth with bracts. — The curious leaves are unique. On wet rotten wood or wet peat, Nfd. to N. C., Iowa and Minn. Europe, Asia. Known from only one spot in Iowa, on a vertical face of moist sandstone.

## 39b Lobes acute or obtuse, not acuminate; leaves not saccate.

Figs. 276 - 281. .... 40

## 40a Extremely slender plants, 0.5 mm. wide or smaller.

Figs. 276 - 278. .... 41

## 40b Larger; shoots, with leaves, more than 0.5 mm. wide; leaves transversely attached or nearly so. Figs. 279 - 281. .... 44



## HOW TO KNOW THE MOSSES

- 41a Leaves obliquely attached to stem, often decurrent; stems covered with a layer of large transparent cells.  
Figs. 276 - 277.....Genus Cephalozia.....42

- 41b Leaves transversely attached, scarcely wider than the stem, deeply cut into two acute lobes; stems opaque.  
Fig. 278.....Genus Cephaloziella.....43

- 42a Leaves divided half or more into two slender, nearly parallel lobes, not decurrent; cells .035-.05 mm. in diameter; monoicous.  
Fig. 276. .... C. bicuspidata

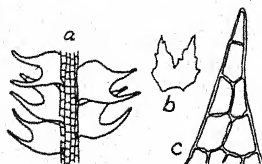


Figure 276

Fig. 276. Cephalozia bicuspidata (L.) Dum. a, shoot; b, bract; c, apex of lobe.—The long parallel lobes of the leaves easily characterize this species. It often has erect, small leafed "flagella". Greenland to Alaska, Cal., Minn., N. E. Europe, Asia, N. Africa.

- 42b Leaves divided about 1/3 into two short converging lobes, decurrent; cells .025-.03 mm. in diameter; dioicous.  
Fig. 277. .... C. media

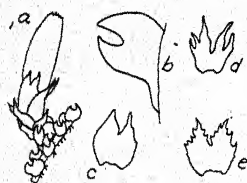


Figure 277

Fig. 277. Cephalozia media Lindb. a, shoot; b, leaf; c, bract; d, bract of C. connivens (Dicks.) Lindb.; e, bract of C. catenulata (Huben.) Spruce. — These tiny plants are widespread over N. America, Europe and Asia. C. connivens has leaf cells .04-.06 mm. and is monoicous. C. catenulata .016-.021 mm., dioicous. In bogs on peat, dead wood or tussocks of sedge.

- 43a Underleaves distinct; lobes of leaf 2-4 cells wide at base; perianth fusiform, with 3-6 folds; dioicous. Fig. 278. .... C. byssacea

- 43b Underleaves absent; lobes of leaf 6-8 cells wide at base; perianth cylindric, 4-5-ridged; monoicous. Fig. 278. .... C. Hampeana

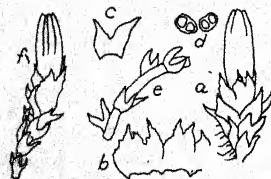


Figure 278

Fig. 278. Cephaloziella byssacea (Roth) Warnst. a, shoot with perianth; b, bract; c, leaf; d, gemmae; e, shoot; f, perianth of C. Hampeana. — Thin films on peaty soil, or single strands among other mosses. Twenty-nine species are recorded from North America, but hardly anybody can tell them apart. One species may vary considerably.

## HOW TO KNOW THE MOSSES

44a Leaves nearly flat; lobes acute, mostly wide apart; gemmae common, angular. Fig. 281. .... Genus Lophozia ..... 46

44b Leaves decidedly concave, the two sides bent upward.  
Figs. 279 - 280. .... 45

45a Gemmae common, angular; leaves clasping stem at base; lobes acute.  
Fig. 279. .... Genus Anastrophyllum

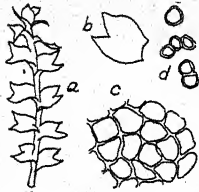


Figure 279

Fig. 279. Anastrophyllum Michauxii (Web.) Buch. a, shoot; b, leaf; c, cells of leaf; d, gemmae. — In dense brownish patches, creeping or erect, the stems about 1 cm. long. Cells of leaf .013-.014 mm. wide. On rotten wood or rocks, Labr. to N. C., Wyo. and Idaho.

45b Without gemmae; lobes obtuse. Fig. 280. .... Genus Marsupella

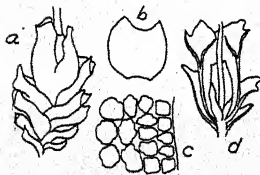


Figure 280

Fig. 280. Marsupella emarginata (Ehrr.) Dum. a, shoot; b, leaf; c, cells of leaf; d, section of perianth and bracts. — On moist banks and rocks, in loose mats; stems to 3 cm. long. Nine other species are recorded for N. America; this and a few others range across the continent in northern U. S. and northward; also in Europe. Perianths of this and the preceding are not often seen.

46a Bracts of involucre 2-5-lobed, with margins entire. Fig. 281. .... L. ventricosa

46b Bracts of involucre 3-5-lobed, with margins toothed.  
Fig. 281. .... L. excisa

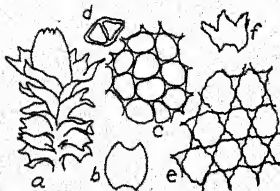


Figure 281

Fig. 281. Lophozia ventricosa (Dicks.) Dum. a, shoot with perianth; b, leaf; c, cells of leaf; d, gemma; e, cells of L. porphyroleuca (Nees) Schiffn.; f, bract of L. excisa (Dicks.) Dum. — These are thin films of green on soil among rocks or on trees, in patches an inch or two across. All three are spread clear across the northern U. S. and Canada, and in Europe.

47a Underlobe larger than upper, both approximately flat.  
Figs. 282 - 286. .... 48

47b Underlobe smaller than upper and completely hidden by it, flat or sac-like. Figs. 287 - 295. .... 52

# HOW TO KNOW THE MOSSES

48a Larger lobe oblong-lanceolate; perianth cylindric and furrowed.

Fig. 282. .... Genus Diplophyllum

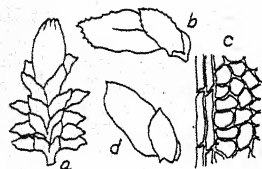


Figure 282

Fig. 282. Diplophyllum albicans (L.) Dum. a, shoot with perianth; b, leaf; c, leaf-cells; d, leaf of D. apiculatum (Evans) Steph. — Thin films on shaded peaty ground; D. albicans is common in England and Europe, and in Wash. and Oregon. D. apiculatum is found from N. E. to Ga., Okla. and Wis. It lacks the elongated vein-like cells up the middle of the leaf. The corresponding plant on our northwest coast is D. taxifolium (Wahl.) Dum.

48b Larger lobe rounded-ovate; perianth with a wide flattened mouth.

Figs. 283 - 286. .... Genus Scapania ..... 49

49a Basal margin of smaller (upper) leaf-lobe with long, branched cilia.

Fig. 283. .... S. Bolanderi

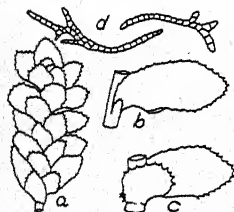


Figure 283

Fig. 283. Scapania Bolanderi Aust. a, shoot; b, leaf and under side of stem; c, leaf and upper side of stem; d, cilia from margin of leaf. — Stems to 8 cm. long, leaves to 1 mm. Common on west coast; Wash., Oregon. On logs and stumps. The toothing of the leaves is like that of other species; the cilia are unique.

49b Basal margin entire or finely toothed, not ciliate.

Figs. 284 - 286. .... 50

50a Lower (larger) lobe of leaf with sharply toothed margin.

Fig. 284. .... S. nemorosa

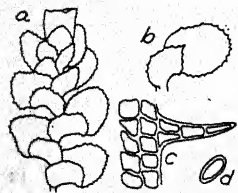


Figure 284

Fig. 284. Scapania nemorosa (L.) Dum. a, shoot; b, leaf and upper surface of stem; c, margin of leaf; d, gemma. — Widespread in N. America and Europe, on moist soil or rocks, often covering many square feet. The tips of shoots are often covered with red-brown gemmae.

50b Lower lobe entire or wavy or with a few minute teeth at apex.

Figs. 285 - 286. .... 51

## HOW TO KNOW THE MOSSES

- 51a** Lower (larger) lobe of leaf entire or very finely toothed at apex, little or not at all decurrent. Fig. 285. .... *S. irrigua*

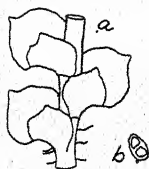


Figure 285

Fig. 285. *Scapania irrigua* (Nees) Dum. a, shoot; b, gemma. — In marshes and bogs, among grasses, northern N. America and Europe. *S. curta* (Mart.) Dum. has leaves longer than wide, with minute trigones, and rhizoids all along under side of stem.

- 51b** Lower lobe with wavy margins, decidedly decurrent.

Fig. 286. .... *S. undulata*

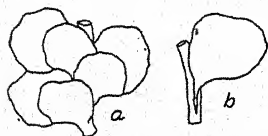


Figure 286

Fig. 286. *Scapania undulata* (L) Dum. a, shoot; b, leaf and lower side of stem. — Submerged, on rocks, in brooks or springs, or on marshy ground or wet wood; all over N. America. Europe. Twenty-four species of *Scapania* are recorded for North America.

- 52a** (b, c) Underlobe of leaf tongue-shaped, attached only at one end; underleaf tongue-shaped, conspicuous. Large plants, 3-8 cm. long.

Figs. 287 - 289. .... Family Porellaceae Genus Porella.....53

- 52b** Underlobe forming a sac or pouch, very narrowly attached to upper lobe (or rarely tongue-shaped); underleaves present, notched at apex. Several archegonia in each perithegium. Small black, brown or green plants, 1 mm. wide or less.

Figs. 290 - 293. .... Family Frullaniaceae.....55

- 52c** Underlobe flat, its longest side attached to upper lobe.

Figs. 294 - 295. ....59

- 53a** Trigones large (in old leaves), bulging into the cells; plant glossy.

Fig. 287. .... *P. navicularis*

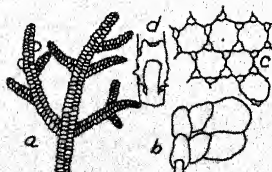


Figure 287

Fig. 287. *Porella navicularis* (Lehm. & Lindb.) Lindb. a, shoot, from above; b, underleaves and underlobes; c, cells of leaf; d, underleaf of *P. Cordaeana*. — Common on our northwest coast, on trees and logs. *P. Roellii* Steph. and *P. Cordaeana* (Hueben.) Evans also occur in our northwest, with very small trigones. *P. Cordaeana* has very narrow underlobes.

# HOW TO KNOW THE MOSSES

53b Trigones small; surface of plant dull green, not glossy.

Figs. 288 - 289. . . . . 54

54a Leaves closely overlapping; large plants on rocks, logs or trees.

Fig. 288. . . . . P. platyphylloidea

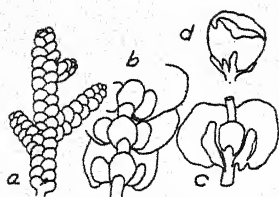


Figure 288

Fig. 288. Porella platyphylloidea (Schwein.) Lindb. a, shoot; b, underlobes and underleaves; c, same of P. platyphylla (L.) Lindb.; d, perianth. — Stems to 8 cm. long, leaves to 1.5 mm.; often covering square feet of surface. The two named species are doubtfully distinguishable; both are widespread in N. America and Europe. Dioicous.

54b Leaves scarcely touching; underlobe very small, tongue-shaped.

Fig. 289. . . . . P. pinnata

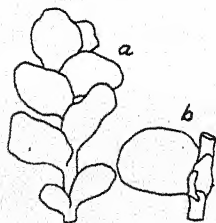


Figure 289

Fig. 289. Porella pinnata L. a, shoot; b, underleaf and underlobe. — In shallow streams, attached to rocks, constantly or frequently submerged. Widespread in eastern U. S. and Europe.

55a Plants dark green; dorsal lobe pointed; cell walls thin.

Fig. 290. . . . . Genus Jubula

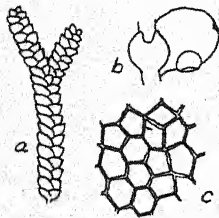


Figure 290

Fig. 290. Jubula pennsylvanica (Steph.) Evans. a, shoot; b, underleaf and underlobe; c, cells of leaf. — N. S. to Ga. and Tenn., on wet shaded rocks, frequent. The only species in North America.

55b Plants black to red-brown or green; dorsal lobe not pointed; cell walls thick, with conspicuous trigones and often with bead-like thickenings along the walls (intermediate thickenings).

Figs. 291 - 293. . . . . Genus Frullania. . . . . 56



# HOW TO KNOW THE MOSSES

- 56a Leaves with a row of large round cells up the middle, like a midrib; underlobe (sac) much longer than broad.

Fig. 291. ....F. Asagrayana

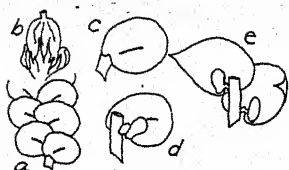


Figure 291

Fig. 291. Frullania Asagrayana Mont. a, shoot seen from above; b, perianth seen from beneath; c, leaf seen from above; d, leaf and underlobe; e, same of F. nisquallensis Sull. — The first makes red-brown mats up to a foot across on bark, Nfd. to Ga, Okla. and Wis. The second grows on rocks and trees, Alaska to northern Cal. F. franciscana Howe of California and F. Californica (Aust.) Evans, Cal. to B. C., have a few enlarged cells in some of the leaves; underleaves of the former have a tooth on each side, of the latter are entire.

- 56b Leaf cells essentially all alike; underlobe, when saccate, as broad as long. Figs. 292 - 293. ....57

57a Underlobe usually tongue-shaped; on shaded rocks; perianth unknown. Fig. 292. ....F. riparia

57b Underlobe sac-like. Figs. 292 - 293. ....58

- 58a Antheridial shoot lateral, short, just below the perianth; cell walls with very small trigones and without intermediate thickenings.

Fig. 292. ....F. inflata

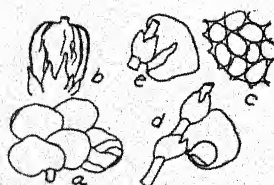


Figure 292

Fig. 292. Frullania inflata Gottsche. a, shoot seen from above, with antheridial branch; b, perianth seen from beneath; c, cells of leaf; d, underlobe and underleaf; e, underlobe and underleaf of F. riparia Hampe. — The first grows on trees, Conn. to Fla., Ariz. and Mexico. The second has about the same range, growing on rocks.



## HOW TO KNOW THE MOSSES

58b Dioicous; trigones and intermediate thickenings conspicuous.

Fig. 293. .... F. eboracensis

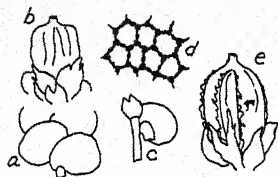


Figure 293

Fig. 293. Frullania eboracensis Gottsche. a, shoot seen from above; b, perianth seen from below; c, leaf and underleaf seen from beneath; d, cells of leaf; e, perianth of F. squarrosa (R. B. & N.) Dum. — The first is a small blackish plant, with smooth perianth, and leaves closely overlapping, wet or dry. The second is much larger, red-brown, the leaves curved down when dry but spreading wide apart (squarrose) when wet; perianth tuberculate. Both are common in the eastern United States, on trees or old wood. Twenty-six species of Frullania are listed for North America.

59a (b, c) Underleaves absent; rhizoids attached in tufts to underlobes; perianth flat. Fig. 294. .... Family Radulaceae, Genus Radula

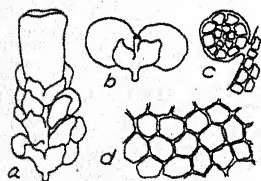


Figure 294

Fig. 294. Radula complanata (L.) Dum. a, shoot with perianth; b, leaves from beneath; c, gemma; d, cells of leaf. — On bark or stones throughout the U. S. and Europe. R. Bolanderi Gottsche, Wash. and Ore., has the margin of the leaf grown fast to the stem beneath. Twelve species are recognized in N. America.

59b Underleaves absent; leaves and ovoid, beaked perianth coarsely papillose. A minute plant, on bark or among other mosses. Our only papillose liverwort. N. S. to Minn., Ark. and the Gulf.

Fig. 295. .... Cololejeunea Biddlecomiae

59c Underleaves present, entire or notched; rhizoids in tufts attached at base of underleaf. Only one archegonium in each perianth.

Fig. 295. .... Family Lejeuneaceae.....60

60a Underleaves orbicular, entire, not lobed.

Fig. 295. .... Genus Leucolejeunea

## HOW TO KNOW THE MOSSES

60b Underleaves notched at apex to form two lobes.

Fig. 295. .... Genus Lejeunea

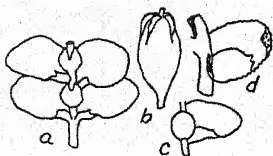
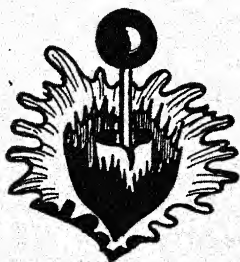


Figure 295

Fig. 295. Lejeunea cavifolia (Ehrh.) Lindb. a, shoot seen from beneath; b, perianth; c, underleaf and underlobe of Leucolejeunea clypeata (Schw.) Evans; d, leaf and underlobe of Cololejeunea Biddlecomiae (Aust.) Evans. — The old genus Lejeunea, with great numbers of species in the tropics, has been split into a number of genera of less unwieldy size. They are all minute plants, on rocks, bark or even on leaves of higher plants. L. cavifolia is widespread in N. America and Europe.



## SYSTEMATIC LIST OF MOSSES AND LIVERWORTS

What's the use? — You may want a check list on which to check the species that you have identified. Another mark may show what is in your collection. And you may find space in which to write when and where you found the species. So little is known about the moss flora of any county in the United States that your record will be of real value. For only a half dozen States is there a published list of mosses that is anywhere near complete.

You may also want to know about the family relationships of the mosses. Here they are, family by family. For the entire list we have followed the Check List for North America issued by the Sullivant Moss Society. In this list the Musci are treated "conservatively", that is, in as few families as possible. Probably most bryologists would now-a-days divide our Hypnaceae into a dozen families. The Hepaticae are divided into families and genera in the most modern and up-to-date fashion — too many families and genera, and species too, some of us think. But here they are. And the sequence of families is considered "natural", that is, according to their blood relationship, so far as that can be done in a linear series.

No one has ever made a satisfactory key to Families of mosses. The only useful keys are to genera. Our keys have clung too close to classification in places. But you cannot get a view of the families from our keys. Hence this Systematic List. A key is at best a compromise; it becomes more and more useful as you use it more.

### Phylum Bryophyta (Atracheata)

#### Class 1. Musci

##### Super-order 1. Sphaginales. Family Sphagnaceae.

###### Genus Sphagnum

- S. palustre* L. Fig. 25
- S. capillaceum* (Weiss) Schrank. Fig. 26
- S. cuspidatum* Ehrh. Fig. 26

##### Super-order 2. Andreaeales. Family Andreaeaceae.

###### Genus Andreaea

- A. Rothii* W. & M. Fig. 24
- A. rupestris* Hedw. Fig. 24

## HOW TO KNOW THE MOSSES

### Super-order 3. Bryales. Division 1. Nematodontae. ✓

#### Family Tetraphidaceae. Genus Tetraphis

- T. geniculata Girgens. See Fig. 27
- T. pellucida Hedw. Fig. 27

#### Family Polytrichaceae

##### Genus Atrichum

- A. angustatum (Brid.) Bry. Eur. Fig. 28
- A. crispum (James) Sull. See Fig. 29
- A. Macmillani (Holz.) Frye See Fig. 28
- A. undulatum (Hedw.) Beauv. Fig. 29
- A. undulatum var. Selwynii (Aust.) Frye See Fig. 29

##### Genus Pogonatum

- P. alpinum (Hedw.) Roehl. Fig. 31
- P. brachyphyllum (Rich.) Beauv. Fig. 30
- P. contortum (Schw.) Sull. See Fig. 31
- P. pensilvanicum (Hedw.) Paris. Fig. 30
- P. urnigerum (Hedw.) Beauv. Fig. 31

##### Genus Polytrichum

- P. commune Hedw. Fig. 33
- P. juniperinum Hedw. Fig. 32
- P. ohioense R. & C. Fig. 33
- P. piliferum Hedw. Fig. 32

#### Family Buxbaumiaceae

##### Genus Buxbaumia

- B. aphylla Hedw. Fig. 34

##### Genus Diphyscium

- D. foliosum (Hedw.) Mohr Fig. 34

### Division 2. Arthrodontae ✓

#### Subdivision 1. Haplolepideae

#### Family Fissidentaceae Genus Fissidens

- F. adiantoides Hedw. See Fig. 42
- F. bryoides Hedw. Fig. 41
- F. cristatus Wils. Fig. 42
- F. grandifrons Brid. Fig. 39
- F. Julianus (Mont.) Schimp. Fig. 39
- F. limbatus Sull. See Fig. 41

## HOW TO KNOW THE MOSSES

- F. minutulus* Sull. See Fig. 41  
*F. obtusifolius* Wils. Fig. 43  
*F. subbasilaris* Hedw. Fig. 40  
*F. taxifolius* Hedw. Fig. 43  
*F. viridulus* (W. & M.) Wahlenb. See Fig. 41

### Family Archidiaceae Genus Archidium

- A. ohioense* Schimp. Fig. 46

### Family Ditrichaceae

#### Genus Bruchia

- B. brevifolia* Sull. Fig. 50  
*B. Ravenellii* Wils. Fig. 50  
*B. Sullivanti* Aust. Fig. 50

#### Genus Ceratodon

- C. purpureus* (Hedw.) Brid. Fig. 64

#### Genus Distichium

- D. capillaceum* (Hedw.) Bry. Eur. Fig. 67  
*D. inclinatum* (Hedw.) Bry. Eur. Fig. 67

#### Genus Ditrichum

- D. lineare* (Sw.) Lindb. Fig. 66  
*D. pallidum* (Hedw.) Hampe Fig. 65  
*D. pusillum* (Hedw.) E. G. B. Fig. 66

#### Genus Trematodon

- T. ambiguus* (Hedw.) Hornsch. Fig. 68  
*T. longicollis* Mx. Fig. 68

#### Genus Pleuridium

- P. acuminatum* Lindb. Fig. 49  
*P. subulatum* (Hedw.) Lindb. Fig. 49

### Family Seligeriaceae Genus Seligeria

- S. calcarea* (Hedw.) Bry. Eur. Fig. 53  
*S. campylopoda* Kindb. Fig. 53  
*S. Doniana* (Smith) C. M. See Fig. 53  
*S. pusilla* (Hedw.) Bry. Eur. Fig. 53

## HOW TO KNOW THE MOSSES

### Family Dicranaceae

#### Genus *Dicranella*

- D. Herminieri* Besch. Fig. 60
- D. heteromalla* (Hedw.) Schimp. Fig. 62
- D. Hilariana* (Mont.) Mitt. Fig. 60
- D. rufescens* (Smith) Schimp. Fig. 61
- D. Schreberi* (Hedw.) Schimp. Fig. 59
- D. squarrosa* (Schrad.) Schimp. See Fig. 59
- D. varia* (Hedw.) Schimp. Fig. 61

#### Genus *Dicranoweisia*

- D. cirrhata* (Hedw.) Lindb. Fig. 70
- D. crispula* (Hedw.) Lindb. Fig. 70

#### Genus *Dicranum*

- D. Bonjeani* DeNot. Fig. 58
- D. condensatum* Hedw. Fig. 57
- D. flagellare* Hedw. Fig. 56
- D. fuscescens* Turn. Fig. 57
- D. majus* Smith See No. 40a
- D. montanum* Hedw. See No. 68a
- D. rugosum* (Hoffm.) Brid. See No. 39a
- D. scoparium* Hedw. Fig. 58

#### Genus *Oncophorus*

- O. polycarpus* (Hedw.) Brid. See Fig. 55
- O. virens* (Hedw.) Brid. See Fig. 55
- O. Wahlenbergii* Brid. Fig. 55

### Family Leucobryaceae

#### Genus *Leucobryum*

- L. albidum* (Brid.) Lindb. See Fig. 54
- L. glaucum* (Hedw.) Schimp. Fig. 54

#### Genus *Octoblepharum*

- O. albidum* Hedw. See Fig. 54

### Family Calymperaceae Genus *Syrhophodon*

- S. floridanus* Sull. Fig. 76
- S. texanus* Sull. Fig. 76



## HOW TO KNOW THE MOSSES

### Family Encalyptaceae    Genus Encalypta

- E. ciliata* Hedw. Fig. 44
- E. rhabdocarpa* Schw. Fig. 45
- E. streptocarpa* Hedw. Fig. 45

### Family Pottiaceae Genus Acaulon

- A. rubrum* (Roehl.) Grout Fig. 48

### Genus Aloina

- A. rigida* (Schultz) Kindb. Fig. 80

### Genus Astomum

- A. Muhlenbergianum* (Sw.) Grout Fig. 48

### Genus Barbula

- B. convoluta* Hedw. See Fig. 83
- B. fallax* Hedw. Fig. 84
- B. unguiculata* Hedw. Fig. 83
- B. vinealis* Brid. Fig. 84

### Genus Desmatodon

- D. latifolius* (Hedw.) Brid. Fig. 77
- D. obtusifolius* (Schw.) Jur. Fig. 77

### Genus Didymodon

- D. recurvirostris* (Hedw.) Jenn. Fig. 78
- D. trifarius* (Hedw.) Brid. Fig. 78

### Genus Gymnostomum

- G. aeruginosum* Smith Fig. 74
- G. calcareum* N. & H. Fig. 74
- G. recurvirostrum* Hedw. Fig. 74

### Genus Phascum

- P. cuspidatum* var. *americanum* R. & C. Fig. 48

### Genus Tortella

- T. fragilis* (H. & W.) Limpr. See Fig. 82
- T. humilis* (Hedw.) Jenn. Fig. 82
- T. tortuosa* (Turn.) Limpr. Fig. 82

## HOW TO KNOW THE MOSSES

### Genus *Tortula*

- T. Bolanderi* (Lesq.) Broth. See Fig. 81
- T. mucronifolia* Schw. Fig. 63
- T. muralis* Hedw. Fig. 81
- T. princeps* DeNot. See Fig. 81
- T. ruralis* (Hedw.) Smith Fig. 81

### Genus *Weisia*

- W. viridula* Hedw. Fig. 57

### Family *Grimmiaceae*

#### Genus *Grimmia*

- G. alpicola* Hedw. Fig. 73
- G. apocarpa* Hedw. Fig. 73
- G. apocarpa* var. *gracilis* (Schl.) W. & M. See No. 67b
- G. laevigata* (Brid.) Brid. Fig. 72
- G. pulvinata* (Hedw.) Smith Fig. 72
- G. trichophylla* Grev. Fig. 72

#### Genus *Hedwigia*

- H. ciliata* Hedw. Fig. 52
- H. ciliata* forma *viridis* (Bry. Eur.) Jones See Fig. 52

#### Genus *Ptychomitrium*

- P. incurvum* (Muhl.) Sull. Fig. 13

#### Genus *Rhacomitrium*

- R. aciculare* Brid. Fig. 69
- R. canescens* Brid. Fig. 79
- R. heterostichum* (Hedw.) Brid. Fig. 69
- R. lanuginosum* (Hedw.) Brid. Fig. 69

#### Genus *Scouleria*

- S. aquatica* Hook. Fig. 71
- S. marginata* E. G. B. See Fig. 71

### Family *Ephemeraceae* Genus *Ephemerum*

- E. cohaerens* (Hedw.) Hampe Fig. 47
- E. crassinervium* (Schw.) C. M. Fig. 47
- E. sessile* (Bry. Eur.) Rabenh. Fig. 47
- E. spinulosum* Schimp. Fig. 47

## HOW TO KNOW THE MOSSES

### Subdivision 2. *Diplolepideae*

#### 1. *Acrocarpi*

##### Family *Funariaceae*

##### Genus *Aphanorhegma*

- A. patens* (Hedw.) Lindb. Fig. 51
- A. serratum* (H. & W.) Sull. Fig. 51

##### Genus *Funaria*

- F. americana* Lindb. Fig. 88
- F. calvescens* Schw. Fig. 87
- F. flavicans* Mx. Fig. 87
- F. hygrometrica* Hedw. Fig. 87
- F. hygrometrica* var. *convoluta* Hampe See Fig. 87
- F. serrata* Brid. Fig. 88

##### Genus *Physcomitrium*

- P. Hookeri* Hampe Fig. 86
- P. immersum* Sull. Fig. 86
- P. turbinatum* (Mx.) Brid. Fig. 86

##### Family *Splachnaceae*

##### Genus *Splachnum*

- S. ampullaceum* Hedw. Fig. 35
- S. luteum* Hedw. See Fig. 35

##### Genus *Tayloria*

- T. serrata* (Hedw.) Bry. Eur. Fig. 36

##### Genus *Tetraplodon*

- T. mnioides* (Hedw.) Bry. Eur. Fig. 36

##### Family *Orthotrichaceae*

##### Genus *Drummondia*

- D. prorepens* (Hedw.) Jenn. Fig. 85

##### Genus *Orthotrichum*

- O. anomalum* Hedw. Fig. 92
- O. cupulatum* (Hoffm.) Brid. Fig. 92
- O. Lyellii* H. & T. Fig. 93
- O. obtusifolium* Brid. Fig. 91
- O. ohioense* S. & L. Fig. 94
- O. pumilum* Dicks. Fig. 94
- O. rupestre* Schleich. Fig. 91
- O. speciosum* Nees Fig. 93
- O. strangulatum* Schw. Fig. 92
- O. texanum* Sull. Fig. 91

## HOW TO KNOW THE MOSSES

### Genus *Ulota*

- U. americana* (Beauv.) Limpr. Fig. 90
- U. crispa* (Hedw.) Brid. Fig. 90
- U. Ludwigii* Brid. Fig. 90

### Family *Timmiaceae* Genus *Timmia*

- T. austriaca* Hedw. See Fig. 89
- T. megapolitana* Hedw. Fig. 89

### Family *Aulacomniaceae* Genus *Aulacomnium*

- A. androgynum* Schw. Fig. 95
- A. heterostichum* (Hedw.) Bry. Eur. Fig. 95
- A. palustre* (W. & M.) Schw. Fig. 95

### Family *Bartramiaceae*

#### Genus *Anacolia*

- A. Menziesii* (Turn.) Paris Fig. 97

#### Genus *Bartramia*

- B. ithyphylla* Brid. Fig. 96
- P. pomiformis* Hedw. Fig. 96

#### Genus *Philonotis*

- P. fontana* (Hedw.) Brid. Fig. 98
- P. longiseta* (Rich.) E. G. B. Fig. 98

#### Genus *Plagiopus*

- P. Oederi* (Brid.) Limpr. 99

### Family *Bryaceae*

#### Genus *Bryum*

- B. argenteum* Hedw. Fig. 102
- B. caespitium* Hedw. Fig. 104
- B. capillare* Hedw. Fig. 104
- B. crassirameum* R. & C. Fig. 105
- B. cuspidatum* (Bry. Eur.) Schimp. See Fig. 104
- B. inclinatum* (W. & M.) Sturm See Fig. 103
- B. pendulum* (Hornsch.) Schimp. Fig. 103
- B. pseudotriquetrum* (Hedw.) Schw. Fig. 105 (= *B. bimum* Schreb.)
- B. uliginosum* (Brid.) Bry. Eur. Fig. 103

## HOW TO KNOW THE MOSSES

### Genus *Leptobryum*

- L. pyriforme* (Hedw.) Schimp. Fig. 100

### Genus *Pohlia*

- P. annotina* (Hedw.) Loeske Fig. 107  
*P. cruda* (Hedw.) Lindb. See No. 112a  
*P. delicatula* (Hedw.) Grout See Fig. 106 (= *P. carnea* Lindb.)  
*P. elongata* Hedw. See Fig. 107  
*P. nutans* (Hedw.) Lindb. Fig. 107  
*P. Wahlenbergii* (W. & M.) Andr. Fig. 106

### Genus *Rhodobryum*

- R. roseum* (Bry. Eur.) Limpr. Fig. 101

### Family *Mniaceae* Genus *Mnium*

- M. affine* Bland. Fig. 110  
*M. cuspidatum* Hedw. Fig. 109, 110  
*M. hornum* Hedw. See No. 118a  
*M. insigne* Mitt. See Fig. 110  
*M. medium* Bry. Eur. See Fig. 110  
*M. Menziesii* (Hook.) C. M. Fig. 108  
*M. orthorhynchum* Brid. Fig. 109, 111  
*M. punctatum* Hedw. Fig. 109  
*M. serratum* Brid. Fig. 111  
*M. spinulosum* Bry. Eur. Fig. 111  
*M. stellare* Hedw. Fig. 109  
*M. venustum* Mitt. Fig. 110

## 2. *Pleurocarpi*

### Family *Hypnaceae*

#### Genus *Amblystegiella*

- A. confervoides* (Brid.) Loeske Fig. 192  
*A. subtilis* (Hedw.) Loeske Fig. 192

#### Genus *Amblystegium*

- A. americanum* Grout See Fig. 160  
*A. compactum* (C. M.) Aust. Fig. 160  
*A. Juratzkanum* Schimp. See Fig. 158  
*A. serpens* (Hedw.) Bry. Eur. Fig. 158  
*A. varium* (Hedw.) Lindb. Fig. 159



## HOW TO KNOW THE MOSSES

### Genus *Bestia*

- B. Breweriana* (Lesq.) Grout Fig. 151

### Genus *Brachythecium*

- B. acutum* (Mitt.) Sull. See Fig. 176  
*B. albicans* (Hedw.) Bry. Eur. Fig. 176  
*B. campestre* Bry. Eur. See Fig. 175  
*B. collinum* (Schleich.) Bry. Eur. Fig. 182  
*B. flagellare* (Hedw.) Jenn. Fig. 178  
*B. flexicaule* R. & C. See Fig. 176  
*B. Nelsoni* Grout Fig. 180  
*B. oxycladon* (Brid.) J. & S. Fig. 174  
*B. populeum* (Hedw.) Bry. Eur. Fig. 178  
*B. reflexum* (Starke) Bry. Eur. Fig. 177  
*B. rivulare* Bry. Eur. Fig. 180  
*B. rutabulum* (Hedw.) Bry. Eur. Fig. 179  
*B. salesbrosum* (W. & M.) Bry. Eur. Fig. 175  
*B. Starkei* (Brid.) Bry. Eur. See Fig. 177  
*B. velutinum* (Hedw.) Bry. Eur. Fig. 181

### Genus *Brotherella*

- B. recurvans* (Mx.) Fleisch. Fig. 196  
*B. Roellii* (R. & C.) Fleisch. See Fig. 196

### Genus *Bryhnia*

- B. graminicolor* (Brid.) Grout Fig. 113  
*B. novae-angliae* (S. & L.) Grout Fig. 113

### Genus *Calliergon*

- C. cordifolium* (Hedw.) Kindb. Fig. 144

### Genus *Calliergonella*

- C. cuspidata* (Brid.) Loeske Fig. 200  
*C. schreberi* (Bry. Eur.) Grout Fig. 201

### Genus *Camptothecium*

- C. lutescens* (Hedw.) Bry. Eur. Fig. 165  
*C. nitens* (Hedw.) Schimp. Fig. 164  
*C. pinnatifidum* (S. & L.) J. & S. See Fig. 165



## HOW TO KNOW THE MOSSES

### Genus *Campylium*

- C. chrysophyllum* (Brid.) Bryhn Fig. 148
- C. hispidulum* (Brid.) Mitt. Fig. 188
- C. polygamum* (Bry. Eur.) Bryhn Fig. 217
- C. stellatum* (Hedw.) L. & Jens. Fig. 198

### Genus *Chamberlainia*

- C. acuminata* (Hedw.) Grout Fig. 171
- C. cyrtophylla* (Kindb.) Grout Fig. 171

### Genus *Cirriphyllum*

- C. Boscii* (Schw.) Grout Fig. 150
- C. cirrosum* (Schw.) Grout Fig. 150
- C. piliferum* (Hedw.) Grout Fig. 150

### Genus *Climacium*

- C. americanum* Brid. Fig. 135
- C. dendroides* (Hedw.) W. & M. Fig. 135
- C. Kindbergii* (R. & C.) Grout Fig. 135

### Genus *Cratoneuron*

- C. commutatum* (Hedw.) Roth Fig. 137
- C. filicinum* (Hedw.) Roth Fig. 137

### Genus *Drepanocladus*

- D. aduncus* (Hedw.) Warnst. Fig. 142
- D. aduncus* var. *Kneiffii* (Bry. Eur.) Warnst. Fig. 142
- D. aduncus* var. *polycarpus* (Bland.) Warnst. Fig. 142
- D. exannulatus* (Guemb.) Warnst. Fig. 143
- D. fluitans* (Hedw.) Warnst. See Fig. 143
- D. intermedius* (Lindb.) Warnst. Fig. 141
- D. revolvens* (C. M.) Warnst. See Fig. 141
- D. Sendtneri* (Schimp.) Warnst. See Fig. 142
- D. uncinatus* (Hedw.) Warnst. Fig. 140
- D. vernicosus* (Lindb.) Warnst. Fig. 140

### Genus *Entodon*

- E. brevisetus* (H. & W.) J. & S. Fig. 221
- E. cladorrhizans* (Hedw.) C. M. Fig. 222
- E. compressus* (Hedw.) C. M. Fig. 223
- E. Drummondii* (Bry. Eur.) J. & S. See Fig. 222
- E. seductrix* (Hedw.) C. M. Fig. 221

## HOW TO KNOW THE MOSSES

### Genus *Eurhynchium*

- E. hians* (Hedw.) J. & S. Fig. 167
- E. oreganum* (Sull.) J. & S. Fig. 169
- E. praelongum* Bryhn See Fig. 169 (= *E. substrigomum* Kindb.)
- E. rusciforme* (Neck.) Milde Fig. 166
- E. serrulatum* (Hedw.) Kindb. Fig. 168
- E. Stokesii* (Turn.) Bry. Eur. See Fig. 169
- E. strigosum* (Hoffm.) Bry. Eur. Fig. 167
- E. strigosum* var. *robustum* Roell See Fig. 167

### Genus *Heterophyllum*

- H. Haldonianum* (Grev.) Kindb. Fig. 206
- H. nemorosum* (Koch) Kindb. See Fig. 206

### Genus *Homalothecium*

- H. nevadense* (Lesq.) R. & C. See Fig. 163
- H. Nuttallii* (Wils.) Grout Fig. 163

### Genus *Homomallium*

- H. adnatum* (Hedw.) Broth. Fig. 191

### Genus *Hygroamblystegium*

- H. irriguum* (Wils.) Loeske Fig. 156
- H. irriguum* var. *spinifolium* (Schimp.) Grout See Fig. 157
- H. noterophilum* (Sull.) Warnst. Fig. 157
- H. orthocladon* (Beauv.) Grout. Fig. 156

### Genus *Hygrohypnum*

- H. dilatatum* (Wils.) Loeske Fig. 203
- H. eugyrium* (Bry. Eur.) Loeske Fig. 205
- H. molle* (Schimp.) Loeske See Fig. 203
- H. novae-caesareae* (Aust.) Grout Fig. 204
- H. ochraceum* (Turn.) Loeske Fig. 202
- H. palustre* (Hedw.) Loeske Fig. 205

### Genus *Hylocomium*

- H. brevirostre* (Beauv.) Bry. Eur. Fig. 138
- H. pyrenaicum* (Spruce) Lindb. See Fig. 138
- H. splendens* (Hedw.) Bry. Eur. Fig. 114
- H. umbratum* (Hedw.) Bry. Eur. Fig. 138

## HOW TO KNOW THE MOSSES

### Genus *Hypnum*

- H. callichroum* Brid. See Fig. 208
- H. circinale* Hook. Fig. 213
- H. crista-castrensis* Hedw. Fig. 210
- H. cupressiforme* Hedw. Fig. 214
- H. cupressiforme* var. *filiforme* Brid. See Fig. 214
- H. curvifolium* Hedw. Fig. 212
- H. fertile* Sendt. See Fig. 215
- H. imponens* Hedw. Fig. 215
- H. molluscum* Hedw. Fig. 211
- H. Patientiae* Lindb. Fig. 207
- H. pratense* Koch See Fig. 207
- H. reptile* Mx. Fig. 216
- H. revolutum* (Mitt.) Lindb. Fig. 209
- H. subimponens* Lesq. Fig. 208
- H. Vaucheri* Lesq. Fig. 214

### Genus *Leptodictyum*

- L. riparium* (Hedw.) Warnst. Fig. 162
- L. riparium* forma *laxirete* (C. & T.) Fig. 162
- L. riparium* forma *fluitans* (L. & J.) Grout Fig. 162
- L. riparium* forma *longifolium* (Schultz) Grout See Fig. 162
- L. siphon* (Beauv.) Broth. See Fig. 162
- L. trichopodium* (Schultz) Warnst. Fig. 155
- L. trichopodium* var. *Kochii* (Bry. Eur.) Broth. Fig. 155

### Genus *Plagiothecium*

- P. denticulatum* (Hedw.) Bry. Eur. Fig. 226
- P. deplanatum* (Sull.) Grout Fig. 228
- P. elegans* (Hook.) Sull. Fig. 229
- P. geophilum* (Aust.) Grout Fig. 227
- P. micans* (Sw.) Paris Fig. 229
- P. Roeseanum* (Hampe) Bry. Eur. Fig. 224
- P. striatellum* (Brid.) Lindb. Fig. 197
- P. sylvaticum* (Brid.) Lindb. See Fig. 226
- P. undulatum* (Hedw.) Bry. Eur. Fig. 225

### Genus *Platygyrium*

- P. repens* (Brid.) Bry. Eur. Fig. 193

### Genus *Porotrichum*

- P. alleghaniense* (C. M.) Grout Fig. 147

## HOW TO KNOW THE MOSSES

### Genus *Pseudisothecium*

- P. myosuroides* (Hedw.) Grout Fig. 170
- P. stoloniferum* (Hook.) Grout Fig. 170

### Genus *Pylaisia*

- P. intricata* (Hedw.) Bry. Eur. See Fig. 218
- P. polyantha* Bry. Eur. Fig. 219
- P. Selwynii* Kindb. Fig. 218
- P. subdenticulata* Schimp. Fig. 219

### Genus *Rhytidiadelphus*

- R. loreus* (Hedw.) Warnst. Fig. 220
- R. squarrosus* (Hedw.) Warnst. See Fig. 220
- R. triquetrus* (Hedw.) Warnst. Fig. 115

### Genus *Rhytidiopsis*

- R. robusta* (Hook.) Broth. Fig. 136

### Genus *Rhytidium*

- R. rugosum* (Hedw.) Kindb. Fig. 112

### Genus *Sciariomium*

- S. Lescurii* (Sull.) Broth. Fig. 149
- S. Fryei* Williams See Fig. 149

### Genus *Scleropodium*

- S. caespitosum* (Wils.) Bry. Eur. Fig. 173
- S. colpophyllum* (Sull.) Grout See Fig. 173
- S. illecebrum* (Hedw.) Bry. Eur. See Fig. 172
- S. obtusifolium* (Hook.) Kindb. Fig. 172

### Genus *Scorpidium*

- S. scorpioides* (Hedw.) Limpr. Fig. 199

### Genus *Sematophyllum*

- S. adnatum* (Mx.) E. G. B. Fig. 194
- S. carolinianum* (C. M.) E. G. B. Fig. 195
- S. marylandicum* (C. M.) E. G. B. See Fig. 195

## HOW TO KNOW THE MOSSES

### Family Leskeaceae

#### Genus Anomodon

- A. attenuatus* (Hedw.) Hueben. Fig. 127
- A. minor* (Beauv.) Lindb. Fig. 126
- A. rostratus* (Hedw.) Schimp. Fig. 125
- A. Rugelii* (C. M.) Keissl. Fig. 127
- A. viticulosus* (Hedw.) H. & T. Fig. 126

#### Genus Claopodium

- C. crispifolium* (Hook.) R. & C. Fig. 124
- C. Whippleanum* (Sull.) R. & C. Fig. 124

#### Genus Helodium

- H. Blandowii* (W. & M.) Warnst. Fig. 130
- H. paludosum* (Sull.) Aust. Fig. 130

#### Genus Leskea

- L. arenicola* Best. Fig. 129
- L. australis* Sharp See No. 138a
- L. gracilescens* Hedw. Fig. 129
- L. nervosa* (Schw.) Myrin Fig. 128
- L. obscura* Hedw. Fig. 129
- L. polycarpa* Hedw. Fig. 129
- L. tectorum* (Braun) Lindb. See Fig. 128

#### Genus Lindbergia

- L. brachyptera* var. *Austinii* (Sull.) Grout Fig. 123

#### Genus Myurella

- M. Careyana* Sull. Fig. 118
- M. julacea* (Schw.) Bry. Eur. See Fig. 118

#### Genus Pseudoleskea

- P. atrovirens* Bry. Eur. Fig. 122

#### Genus Thelia

- T. asprella* Sull. Fig. 120
- T. hirtella* (Hedw.) Sull. Fig. 121
- T. Lescurii* Sull. Fig. 120



## HOW TO KNOW THE MOSSES

### Genus *Thuidium*

- T. abietinum* (Brid.) Bry. Eur. Fig. 133
- T. delicatulum* (Hedw.) Mitt. Fig. 134
- T. microphyllum* (Hedw.) Best Fig. 131
- T. minutulum* (Hedw.) Bry. Eur. Fig. 132
- T. pygmaeum* Bry. Eur. Fig. 132
- T. recognitum* (Hedw.) Lindb. Fig. 134
- T. scitum* (Beauv.) Aust. Fig. 133
- T. virginianum* (Brid.) Lindb. Fig. 131

### Family *Hookeriaceae* Genus *Hookeria*

- H. acutifolia* Hook. Fig. 190
- H. lucens* (Brid.) Smith. Fig. 190

### Family *Neckeraceae*

#### Genus *Homalia*

- H. Jamesii* Schimp. Fig. 161

#### Genus *Neckera*

- N. Douglasii* Hook. Fig. 232
- N. Menziesii* Hook. Fig. 230
- N. pennata* Hedw. Fig. 231

### Family *Leucodontaceae*

#### Genus *Leptodon*

- L. nitidus* Sull. See Fig. 153
- L. ohioensis* Sull. See Fig. 153
- L. trichomitrium* (Hedw.) Mohr Fig. 153

#### Genus *Leucodon*

- L. brachypus* Brid. Fig. 186
- L. julaceus* (Hedw.) Sull. Fig. 187
- L. sciuroides* (Hedw.) Schw. Fig. 187

### Family *Cryphaeaceae*

#### Genus *Alsia*

- A. californica* (H. & A.) Sull. Fig. 139

#### Genus *Antitrichia*

- A. californica* Sull. Fig. 152
- A. curtipendula* (Hedw.) Brid. Fig. 152



## HOW TO KNOW THE MOSSES

### Genus *Cryphaea*

- C. glomerata* Schimp. Fig. 119
- C. nervosa* (H. & W.) Bry. Eur. See Fig. 119

### Genus *Dendroalsia*

- D. abietina* (Hook.) E. G. B. Fig. 116

### Family *Fabroniaceae*

#### Genus *Clasmatodon*

- C. parvulus* (Hampe) Sull. Fig. 154

#### Genus *Fabronia*

- F. ciliaris* (Brid.) Brid. Fig. 189
- F. pusilla* Raddi Fig. 189
- F. Ravenelii* Sull. See Fig. 189

#### Genus *Schwetschkeopsis*

- S. denticulata* (Sull.) Broth. Fig. 117

### Family *Fontinalaceae*

#### Genus *Brachelyma*

- B. subulatum* (Beauv.) Schimp. Fig. 146

#### Genus *Dichelyma*

- D. capillaceum* Bry. Eur. Fig. 145

#### Genus *Fontinalis*

- F. antipyretica* Hedw. Fig. 193
- F. antipyretica* var. *gigantea* Sull. See Fig. 183
- F. dalecarlica* Bry. Eur. Fig. 184
- F. Duriaei* Schimp. Fig. 185
- F. Lescurii* Sull. Fig. 185
- F. neomexicana* S. & L. See Fig. 183
- F. novae-angliae* Sull. See Fig. 184

## Class 2. *Hepaticae* Order *Jungermanniales*

### Family *Ptilidiaceae*

#### Genus *Ptilidium*

- P. californicum* (Aust.) U. & C. See Fig. 252
- P. ciliare* (L.) Nees See Fig. 252
- P. pulcherrimum* (Web.) Hampe Fig. 252

## HOW TO KNOW THE MOSSES

### Genus *Blepharostoma*

*B. trichophyllum* (L.) Dumort. Fig. 255

### Genus *Trichocolea*

*T. tomentella* (Ehrh.) Dumort. Fig. 253

### Family *Lepidoziaceae*

#### Genus *Bazzania*

*B. tricrenata* (Wahl.) Trevis. Fig. 257

*B. trilobata* (L.) S. F. Gray Fig. 257

#### Genus *Lepidozia*

*L. reptans* (L.) Dumort. Fig. 256

#### Genus *Microlepidozia*

*M. setacea* (Web.) Joerg. See Fig. 254

*M. sylvatica* (Evans) Joerg. Fig. 254

### Family *Calypogeaceae* Genus *Calypogeia*

*C. fissa* (L.) Raddi Fig. 258

*C. Trichomanis* (L.) Corda Fig. 258

### Family *Cephaloxiaceae*

#### Genus *Cephalozia*

*C. bicuspidata* (L.) Dumort. Fig. 276

*C. catenulata* (Hueben.) Spruce Fig. 277

*C. connivens* (Dicks.) Lindb. Fig. 277

*C. media* Lindb. Fig. 277

#### Genus *Nowellia*

*N. curvifolia* (Dicks.) Mitt. Fig. 275

#### Genus *Odontoschisma*

*O. denudatum* (Mart.) Dumort. Fig. 260

*O. prostratum* (Sw.) Trevis. Fig. 260

### Family *Cephaloxiellaceae* Genus *Cephaloxiella*

*C. byssacea* (Roth) Warnst. Fig. 278

*C. Hampeana* (Nees) Schiffn. Fig. 278

## HOW TO KNOW THE MOSSES

### Family Harpenthaceae

#### Genus Lophocolea

- L. bidentata* (L.) Dumort. Fig. 268
- L. cuspidata* (Nees) Limpr. Fig. 268
- L. heterophylla* (Schröd.) Dumort. Fig. 267
- L. minor* Nees Fig. 267

#### Genus Chiloscypus

- C. pallens* (Ehrh.) Dumort. Fig. 259
- C. polyanthus* (L.) Corda Fig. 259

#### Genus Harpenthus

- H. scutatus* (W. & M.) Spruce Fig. 266

### Family Jungermanniaceae

#### Genus Lophozia

- L. excisa* (Dicks.) Dumort. Fig. 281
- L. porphyroleuca* (Nees) Schiffn. Fig. 281
- L. ventricosa* (Dicks.) Dumort. Fig. 281

#### Genus Anastrophyllum

- A. Michauxii* (Web.) Buch Fig. 279

#### Genus Tritomaria

- T. exsecta* (Schmid.) Schiffn. Fig. 269
- T. exsectiformis* (Bredl.) Schiffn. Fig. 269
- T. quinquedentata* (Huds.) Buch Fig. 269

#### Genus Orthocaulis

- O. Floerkei* (W. & M.) Buch Fig. 273
- O. Kunzeanus* (Hueben.) Buch Fig. 273
- O. quadrilobus* (Lindb.) Buch Fig. 274

#### Genus Barbilophozia

- B. barbata* (Schmid.) Loeske Fig. 271
- B. Hatcheri* (Evans) Loeske Fig. 272
- B. lycopodioides* (Wallr.) Loeske See Fig. 272

#### Genus Jungermannia

- J. cordifolia* Hook. Fig. 262
- J. lanceolata* L. Fig. 263
- J. pumila* With. Fig. 262

## HOW TO KNOW THE MOSSES

### Genus *Jamesoniella*

- J. autumnalis* (DC) Steph. Fig. 261

### Genus *Plectocolea*

- P. crenulata* (Smith) Evans Fig. 270  
*P. hyalina* (Lyell) Mitt. Fig. 270  
*P. rubra* (Gottsche) Evans See Fig. 270

### Family Marsupellaceae

#### Genus *Marsupella*

- M. emarginata* (Ehrh.) Dumort. Fig. 280

### Family Plagiochilaceae Genus *Plagiochila*

- P. asplenioides* (L) Dumort. Fig. 264  
*P. Sullivantii* Gottsche Fig. 265

### Family Scapaniaceae

#### Genus *Diplophyllum*

- D. albicans* (L) Dumort. Fig. 282  
*D. apiculatum* (Evans) Steph. Fig. 282  
*D. taxifolium* (Wahlenb.) Dumort. See Fig. 282

#### Genus *Scapania*

- S. Bolanderi* Aust. Fig. 283  
*S. curta* (Mart.) Dumort. See Fig. 285  
*S. irrigua* (Nees) Dumort. Fig. 285  
*S. nemorosa* (L) Dumort. Fig. 284  
*S. undulata* (L) Dumort. Fig. 286

### Family Porellaceae

#### Genus *Porella*

- P. Cordaeana* (Hueben.) Evans 287  
*P. navicularis* (L. & L.) Lindb. Fig. 287  
*P. pinnata* L. Fig. 289  
*P. platyphylla* (L.) Lindb. Fig. 288  
*P. platyphylloidea* (Schwein.) Lindb. Fig. 288  
*P. Roellii* Steph. See Fig. 287

### Family Radulaceae

#### Genus *Radula*

- R. Bolanderi* Gottsche See Fig. 294  
*R. complanata* (L.) Dumort. Fig. 294

## HOW TO KNOW THE MOSSES

### Family Frullaniaceae

#### Genus Frullania

- F. Asagrayana* Mont. Fig. 291
- F. californica* (Aust.) Evans See Fig. 291
- F. eboracensis* Gottsche Fig. 293
- F. franciscana* Howe See Fig. 291
- F. inflata* Gottsche Fig. 292
- F. nisquallensis* Sull. Fig. 291
- F. riparia* Hampe Fig. 292
- F. squarrosa* (R. Bl. & N.) Dumort. Fig. 293

#### Genus Jubula

- J. pennsylvanica* (Steph.) Evans Fig. 290

### Family Lejeuneaceae

#### Genus Leucolejeunea

- L. clypeata* (Schwein.) Evans Fig. 295

#### Genus Lejeunea

- L. cavifolia* (Ehrh.) Lindb. Fig. 295

#### Genus Cololejeunea

- C. Biddlecomiae* (Aust.) Evans Fig. 295

### Order Metzgeriales Family Fossombroniaceae

#### Genus Fossombronia

- F. foveolata* Lindb. Fig. 246
- F. Wondraczekii* (Corda) Dumort. Fig. 246

### Family Pelliaceae

#### Genus Pellia

- P. epiphylla* (L.) Corda Fig. 250
- P. Fabroniana* Raddi See Fig. 250
- P. Neesiana* (Gottsche) Limpr. Fig. 250

### Family Blasiaceae Genus Blasia

- B. pusilla* L. Fig. 247

### Family Pallaviciniaceae

#### Genus Pallavicinia

- P. Leyellii* (Hook.) S. F. Gray Fig. 249



## HOW TO KNOW THE MOSSES

### Genus *Moerckia*

*M. Flotowiana* (Nees) Schiffn. See Fig. 249

### Family Metzgeriaceae Genus *Metzgeria*

*M. conjugata* Lindb. Fig. 248

*M. furcata* (L) Dumort. Fig. 248

### Family Ricciaceae Genus *Riccardia*

*R. multifida* (L) S. F. Gray Fig. 251

*R. palmata* (Hedw.) Carruth. Fig. 251

*R. pinguis* (L) S. F. Gray See Fig. 251

### Order Marchantiales

#### Family Marchantiaceae

#### Genus *Marchantia*

*M. polymorpha* L. Fig. 236

#### Genus *Preissia*

*P. quadrata* (Scop.) Nees. Fig. 239

#### Genus *Conocephalum*

*C. conicum* (L) Dumort. Fig. 238

#### Genus *Lunularia*

*L. cruciata* (L) Dumort. Fig. 237

#### Family Rebouliaaceae

#### Genus *Reboulia*

*R. hemisphaerica* (L) Raddi Fig. 241

#### Genus *Mannia*

*M. californica* (Gottsche) Wheeler See Fig. 240

*M. fragrans* (Balb.) Frye & Clark Fig. 240

#### Genus *Asterella*

*A. Ludwigii* (Schw.) Underw. See Fig. 242

*A. tenella* (L) Beauv. Fig. 242

#### Family Ricciaceae

#### Genus *Ricciocarpus*

*R. natans* (L) Corda Fig. 243



## HOW TO KNOW THE MOSSES

### Genus *Riccia*

- R. fluitans* L. Fig. 245
- R. Frostii* Aust. Fig. 244
- R. glauca* L. Fig. 244

### Order *Sphaerocarpales* Family *Sphaerocarpaceae*

#### Genus *Sphaerocarpus*

- S. texanus* Aust. Fig. 233

### Class *Anthocerotae* Order *Anthocerotales*

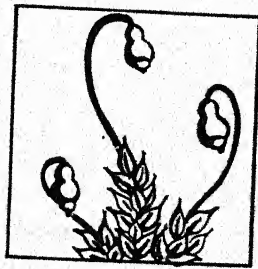
#### Family *Anthocerotaceae*

#### Genus *Anthoceros*

- A. fusiformis* Aust. Fig. 234
- A. laevis* L. Fig. 234

### Genus *Notothylas*

- N. orbicularis* (Schwein.) Sull. Fig. 235





## INDEX AND GLOSSARY

A

Acaulon 35, 137  
 rubrum 35, 137  
 Acrocarpi 13, 23, 50, 139  
 Acrocarpous, having the sporophyte at the end of a stem or ordinary leafy branch (Fig. 296)



Fig. 296

Acumen, the tapering narrow point of an acuminate leaf.

Acuminate, tapering in the manner of Fig. 297. Note curvature of margin of leaf.

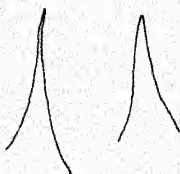


Fig. 297

Acute, ending in a sharp angle, less than 90° (Fig. 298)

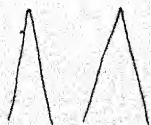


Fig. 298

Alar cells, the cells at the basal angle of the leaf 16 (Fig. 299)

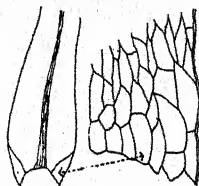


Fig. 299

Aloina 48, 137  
 rigida 48, 137  
 Alsia 72, 148  
 californica 72, 148  
 Amblystegiella 94, 141  
 confervoides 94, 141  
 subtilis 94, 141  
 Amblystegium 79, 141  
 americanum 81, 141  
 compactum 81, 141  
 Juratzkanum 79, 80, 141  
 serpens 80, 141  
 varium 79, 80, 141  
 Anacolia 56, 140  
 Menziesii 56, 140  
 Anastrophyllum 126, 151  
 Michauxii 126, 151  
 Andreaea 22, 25, 133  
 Rothii 25, 133  
 rupestris 25, 133  
 Andreaeaceae 12, 25, 133  
 Andreaeales 12, 23, 25, 133  
 Annulus, a ring of thick walled cells between the mouth of the capsule and the lid, like the rubber gasket on a jar 11, 15 (Fig. 300)



Fig. 300

Anomodon 68, 147  
 attenuatus 68, 147  
 minor 68, 147  
 rostratus 68, 147  
 Rugelii 68, 147  
 viticulosus 68, 147

Antheridium, the male reproductive organ containing the sperms 8, 17 (Fig. 301)



Fig. 301

Anthoceros 110, 155  
 fusiformis 110, 155  
 laevis 11, 110, 155  
 Anthocerotaceae 110, 155  
 Anthocerotae 10, 12, 24, 110, 155  
 Anthocerotales 23, 110, 155  
 Antitrichia 78, 148  
 californica 78, 148  
 curtispindula 78, 148  
 Apex, the tip; the end opposite the point of attachment.  
 Apical, belonging to the apex or tip.  
 Apiculate, ending in an abrupt, short, sharp point, but not stiff. (Fig. 302)



Fig. 302

Aphanorhegma 36, 139  
 patens 36, 139  
 serratum 36, 37, 51, 139  
 Apophysis, see Hypophysis  
 Appendiculate, of cilia with small transverse spurs at intervals along the margin 17 (Fig. 303)



Fig. 303

Apple moss 56  
 Archegonium, the female reproductive organ containing the egg 8, 9, 11, 17, 18 (Fig. 304)



Fig. 304

# HOW TO KNOW THE MOSSES

Archidiaceae 34, 135  
 ✓ Archidium 34, 135  
   ohioense 34, 135  
 Arthrodonteae 12, 23, 26,  
   134  
 Asterella 113, 154  
   Ludwigii 113, 154  
   tenella 113, 154  
 Astomum 35, 46, 137  
   Muhlenbergianum 35, 137  
 Atracheata 7, 12, 24, 133  
 Atrichum 27, 134  
   angustatum 27, 134  
   crispum 27, 134  
   Macmillani 27, 134  
   undulatum 27, 134  
   var. Selwynii 27, 134  
 Aulacomniaceae 140  
 Aulacomnium 55, 140  
   androgynum 55, 140  
   heterostichum 3, 55, 56,  
   57, 140  
   palustre 55, 140  
 Auricle, a lobe or bulge at  
   the base of a leaf. (Fig.  
   305)

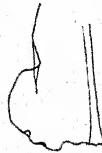


Fig. 305

Autoicous, having male and  
 female organs on the  
 same plant, either mingled  
 together in the same  
 cluster, or antheridia in a  
 cluster just below the ar-  
 chegonia, or some where  
 else along the shoot, or  
 on a tiny shoot attached  
 to the rhizoids of the fe-  
 male plant.  
 Awn, a bristle at the tip of  
 a leaf 16

## B

Barbilophozia 151  
   barbata 123, 151  
   Hatcheri 124, 151  
   lycopodioides 124, 151  
 Barbula 48, 137  
   convoluta 49, 137  
   fallax 50, 137  
   unguiculata 49, 137  
   vinealis 50, 137  
 Bartramia 56, 140  
   ithyphylla 56, 140  
   pomiformis 56, 140  
 Bartramiaceae 55, 140  
 Bazzania 119, 150  
   tricrenata 119, 150  
   trilobata 119, 150  
 Beak, a prolonged narrow  
   tip of an operculum. (Fig.  
   306)



Fig. 306

Bestia 77, 142  
   Breweriana 77, 142  
 Bifid, two-cleft to about the  
   middle.  
 Bilobed, with two divisions,  
   especially round ones.  
 Blasia 115, 153  
   pusilla 115, 153  
 Blasiaceae 1-3  
 Blepharostoma 118, 150  
   trichophyllum 118, 150  
 Bog, a watery mass of de-  
   cayed vegetation with acid  
   reaction.  
 Books 20  
 Bordered, having the mar-  
   gin different from the  
   rest of the leaf either in  
   shape or color of cells.  
   (Fig. 307)



Fig. 307

Brachelyma 75, 149  
   subulatum 75, 149  
 Brachythecium 86, 142  
   acutum 88, 142  
   albicans 88, 142  
   campestre 87, 142  
   collinum 90, 142  
   flagellare 89, 142  
   flexicaule 88, 142  
   Nelsoni 89, 142  
   oxycladon 87, 142  
   var. dentatum 87, 142  
   populeum 89, 142  
   reflexum 78, 88, 142  
   rivulare 21, 89, 142  
   rutabulum 89, 142  
   salebrosum 87, 88, 89, 142  
   Starkii 88, 142  
   velutinum 90, 142  
 Bract, a special leaflike  
   structure at the base of  
   a reproductive organ or  
   cluster 19  
 Bracteole, a small bract;  
   modified underleaf.  
 Brood-bodies, detachable cells  
   or organs which give rise  
   vegetatively to new plants;  
   gemmae.  
 Brotherella 95, 142  
   recurvans 95, 142  
   Roellii 95, 142  
 Bruchia 36, 135  
   brevifolia 36, 135  
   Ravenellii 36, 135  
   Sullivanti 36, 135  
 Bryaceae 140  
 Bryales 12, 23, 134  
 Bryhnia 63, 142  
   graminicolor 63, 64, 142  
   novae-angliae 22, 64, 142

Bryologia Europaea 20, 21  
 Bryologist 4, 21  
 Bryophyta 10, 24, 133  
 Bryophytes 7  
 Bryum 22, 58, 140  
   argenteum 3, 22, 59, 140  
   bimum 17, 60, 140  
   caespitium 3, 60, 140  
   capillare 59, 60, 140  
   crassiroseum 60, 140  
   cuspidatum 60, 140  
   inclinum 59, 140  
   pendulum 59, 140  
   pseudotriquetrum 60, 140  
   uliginosum 59, 140  
 ✓ Buxbaumia 134  
   aphylla 3, 29, 134  
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## C

Calliergon 74, 142  
   cordifolium 74, 82, 142  
 Calliergonella 96, 142  
   cuspidata 97, 142  
   Schreberi 97, 142  
 Calymperaceae 136  
 Calypogeia 18, 119, 150  
   fissa 119, 150  
   Trichomanis 119, 150  
 Calypogeaceae 150  
 Calyptra, the thin covering  
   or hood fitted over the  
   upper part of the capsule;  
   it is a part of the arche-  
   gonium 9, 11, 16 (Fig.  
   308c)



Fig. 308

Camptothecium 82, 142  
   lutescens 83, 142  
   nitens 83, 142  
   pinnatifidum 83, 142  
 Campyllum 96, 143  
   chrysophyllum 76, 79, 143  
   hispidulum 92, 143  
   polygamum 82, 96, 103,  
   143  
   stellatum 96, 103, 143  
 Capsule, the spore-contain-  
   ing sac which, with the  
   seta and foot compose the  
   sporophyte 9, 11, 16, 19  
   (Figs. 13, 309)



Fig. 309

# HOW TO KNOW THE MOSSES

Cephalozia 125, 150  
 bicuspidata 125, 150  
 catenulata 125, 150  
 connivens 125, 150  
 media 125, 150  
 Cephaloziaceae 150  
 Cephaloziella 125, 150  
 byssacea 125, 150  
 Hampeana 125, 150  
 Cephaloziellaceae 150  
 Ceratodon 42, 47, 135  
 purpureus 3, 42, 135  
 Chamberlainia 85, 143  
 acuminata 85, 143  
 cyrtophylla 85, 143  
 Chiloscypus 119, 120, 151  
 pallescens 119, 151  
 polyanthus 119, 151  
 Cilia, hair-like appendages 12, 17  
 Circinate, bent around in more or less of a circle.  
 Cirriophyllum 77, 143  
 Boschi 77, 143  
 cirrhosum 77, 143  
 piliferum 77, 143  
 Cladonia 7  
 Clopodium 67, 147  
 crispifolium 67, 147  
 Whippleanum 67, 147  
 Clark 20  
 Clasmatodon 78, 149  
 parvulus 78, 149  
 Climacium 22, 71, 143  
 americanum 71, 143  
 dendroides 71, 143  
 Kindbergii 71, 143  
 Collecting mosses 14  
 Cololejeunea 153  
 Biddlecomiae 131, 132, 153  
 Columella, the central axis of the capsule, around which are the spores 34 (Fig. 310c)

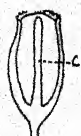


Fig. 310

Complanate, flattened; more or less in one plane.  
 Complicate-bilobed, with two lobes, the lobes folded together 18 (Fig. 363)  
 Conoccephalum 112, 154  
 conicum 112, 154  
 Cord moss 51  
 Cordate, heart-shaped, the broadest portion near the attachment (Fig. 311)



Fig. 311

Costa, the midrib of a moss leaf 16  
 Costate, having a costa 23

Cratoneuron 72, 143  
 commutatum 72, 143  
 filicinum 72, 143  
 Cryphaea 66, 149  
 glomerata 66, 149  
 nervosa 66, 149  
 Cryphaeaceae 148  
 Cucullate, forming a pocket opening on one side; of a calyptra usually cone-shaped and slit on one side only 16 (Fig. 312)



Fig. 312

Decurrent, running down, the margin of a leaf extending below its point of attachment 16 (Fig. 313)



Fig. 313

Dendroaalsia 65, 149  
 abietina 65, 149  
 Dendroid, having an erect stem with branches, like a little tree 22  
 Dentate, toothed with the teeth pointing outward. (Fig. 314)



Fig. 314

Denticulate, dentate with little teeth (Fig. 315)  
 Desmatodon 21, 47, 137  
 latifolius 47, 137  
 obtusifolius 47, 137  
 Dichelyma 75, 149  
 capillaceum 75, 149  
 Dicranaceae 136

Fig. 315

Dicranella 38, 136  
 Herminieri 40, 136  
 heteromalla 3, 41, 136  
 Hilariana 40, 136  
 rufescens 41, 136  
 Schreberi 40, 136  
 squarrosa 40, 136  
 varia 41, 136  
 Dicranoweisia 44, 136  
 crispula 44, 136  
 serrata 44, 136  
 Dicranum 38, 136  
 Bonjeani 40, 136  
 condensatum 39, 136  
 flagellare 39, 136  
 fuscescens 39, 136  
 majus 39, 136  
 montanum 48, 136  
 rugosum 39, 136  
 scoparium 40, 136  
 Didymodon 45, 137  
 recurvirostris 47, 137  
 trifarius 47, 137  
 Dimorphic, having two very different kinds of leaves on stems and branches.  
 Dioicous, having male and female organs on different plants 17.  
 Diphygium 134  
 foliosum 29, 134  
 Diploid, having two homologous sets of chromosomes 9  
 Diplolepidaceae 12, 23, 31, 50, 139  
 Diplophyllum 127, 152  
 albicans 127, 152  
 apiculatum 127, 152  
 taxifolium 127, 152  
 Dissecting 15  
 Distal, farthest from the point of attachment  
 Distichium 43, 135  
 capillaceum 43, 135  
 inclinatum 43, 135  
 Ditrichaceae 135  
 Ditrichum 42, 135  
 lineare 43, 135  
 pallidum 42, 135  
 pusillum 43, 135  
 Dixon 20  
 Drepanocladus 10, 73, 82, 143  
 aduncus 3, 74, 143  
 var. Kneiffii 74, 143  
 var. polycarpus 74, 143  
 var. typicus 74, 143  
 exannulatus 74, 143  
 fluitans 74, 143  
 intermedius 73, 143  
 revolvens 73, 143  
 Sendtneri 74, 143  
 uncinatus 73, 143  
 vernicosus 73, 143  
 Drummondia 22, 50, 139  
 prorepens 50, 139

# HOW TO KNOW THE MOSSES

## E

- Ecostate, without a midrib 23  
 Egg, the female germ cell or gamete 8, 17  
 Elater, elongate and usually spirally thickened cells mixed with the spores, in liverworts only 19  
 Elongate, considerably longer than wide.  
 Embryo, the many-celled product of the fertilized egg, still but little differentiated 8  
 Encalypta 22, 33, 137  
     *ciliata* 33, 137  
     *rhabdocarpa* 34, 137  
     *streptocarpa* 33, 34, 137  
 Encalyptaceae 12, 33, 137  
 Entire, with an even margin, not notched or toothed.  
 Entodon 103, 143  
     *brevisetus* 104, 143  
     *cladorrhizans* 105, 143  
     *compressus* 105, 143  
     *Drummondii* 105, 143  
     *seductrix* 104, 143  
 Envelopes 14  
 Ephemeraceae 138  
 Ephemerum 35, 36, 138  
     *cohaerens* 35, 138  
     *crassinervium* 35, 138  
     *sessile* 35, 138  
     *spinulosum* 35, 138  
 Epiphragm, a membrane covering the mouth of the capsule under the operculum in Polytrichaceae (Fig. 316e)



Fig. 316

- Equipment 14  
 Equitant, when the lower part of a leaf appears to be split so that it stands astride of the stem and the base of the next leaf above: *Fissidens* (Fig. 317)

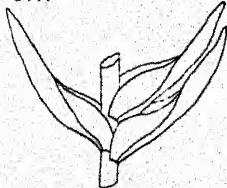


Fig. 317

- Eurhynchium* 83, 144  
     *hians* 84, 144  
     *oreganum* 85, 144  
     *prolongum* 85, 144  
     *rusciforme* 83, 84, 144  
     *serrulatum* 82, 84, 144  
     *Stokesii* 85, 144  
     *strigosum* 84, 144  
     var. *robustum* 84, 144

- Exannulate, without an annulus.  
 Excurrent, with the costa extending beyond the tip of the leaf (Fig. 318)

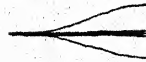


Fig. 318

- Extinguisher moss 33

## F

- Fabronia* 93, 149  
     *ciliaris* 93, 149  
     *pusilla* 93, 149  
     *Ravenellii* 93, 149  
 Fabroniaceae 149  
 Falcate, curved like a sickle (Fig. 319)



Fig. 319

- Falcate-secund, each leaf falcate and all bent in the same direction.  
 Fen, a water-soaked area with lime in solution.  
 Fertilization 8  
 Filiform, thread-like 16  
*Fissidens* 31, 134  
     *adiantoides* 32, 134  
     *bryoides* 32, 134  
     *cristatus* 32, 134  
     *grandifrons* 31, 134  
     *Julianus* 31, 134  
     *limbatus* 32, 134  
     *minutus* 32, 135  
     *obtusifolius* 33, 135  
     *subbasilaris* 32, 135  
     *taxifolius* 33, 135  
 Fissidentaceae 31, 134  
 Floccid, soft and flabby in texture.  
 Flagella, slender whip-like branches.  
 Flexuose, irregularly wavy.  
 Fontinalaceae 149  
*Fontinalis* 90, 149  
     *antipyretica* 90, 149  
     var. *gigantea* 90, 149  
     *dalecarlica* 91, 149  
     *Duriaei* 91, 149  
     *Lescurii* 91, 149  
     *neomexicana* 90, 149  
     *novae-angliae* 91, 149  
 Foot, basal and absorbing portion of the sporophyte 9, 11

- Fossombronia* 114, 153  
     *foveolata* 114, 153  
     *Wondraczekii* 114, 153  
 Fossombroniaceae 114, 153  
 Fountain moss 57  
 Frond, a much-divided leaf, as of a fern.  
 Frondose, resembling a frond.  
 Fruit, a term often applied to the capsule—not strictly accurate.  
*Frullania* 18, 19, 129, 153  
     *Asagrayana* 130, 153  
     *californica* 130, 153  
     *eboracensis* 131, 153  
     *franciscana* 130, 153  
     *inflata* 130, 153  
     *misquallensis* 150, 153  
     *riparia* 130, 153  
     *squarrosa* 131, 153  
 Frullaniaceae 128, 153  
 Frye 20  
*Funaria* 8, 9, 51, 139  
     *americana* 52, 139  
     *calvescens* 51, 139  
     *flavicans* 51, 139  
     *hygrometrica* 3, 21, 51, 139  
     var. *convoluta* 51, 139  
     *serrata* 52, 139  
 Funariaceae 139

## G

- Gametophyte, the plant bearing the gametes; the sexual generation 11 (Fig. 13)  
 Gemma, a cell or cluster of cells, often bud-like, borne on the gametophyte, capable of reproducing the plant vegetatively; brood body.  
 Gene, a determinant of hereditary characters 9  
 Genetics, the study of heredity 9  
*Glycerine* 14, 15  
*Grimmia* 22, 30, 45, 138  
     *alpicola* 45, 138  
     *apocarpa* 45, 138  
     var. *gracilis* 48, 138  
     *laevigata* 45, 138  
     *pulvinata* 45, 46, 138  
     *trichophylla* 45, 46, 138  
 Grimmiaceae 138  
 Grout, A. J. 20, 21  
*Gymnostomum* 46, 137  
     *aeruginosum* 46, 137  
     *calcareum* 46, 137  
     *recurvirostrum* 46, 137

## H

- Haircap mosses 29  
 Haploid, with one set of chromosomes, all different 9  
 Haplolepidaceae 12, 23, 30, 115, 134  
 Harpanthaceae 151  
*Harpanthus* 122, 151  
     *scutatus* 122, 151  
*Hedwigia* 22, 37, 138  
     *ciliata* 37, 138  
     f. *viridis* 37, 138



# HOW TO KNOW THE MOSSES

*Helodium* 22, 69, 147  
*Blandowii* 69, 147  
*paludosum* 69, 147  
 Helps to the mosses 22  
*Hepaticae* 11, 12, 23, 24, 109, 149  
*Herbarium* 14  
*Heterophyllum* 99, 144  
*Haldanianum* 99, 144  
*nemorosum* 99, 144  
*Hexagonal* 15  
*Holzinger* 21  
*Homalia* 81, 148  
*Jamesii* 81, 148  
*Homalothecium* 82, 144  
*Nevadense* 82, 144  
*Nuttallii* 82, 144  
*Homomallium* 93, 144  
*adnatum* 93, 144  
*Hookeria* 93, 148  
*acutifolia* 93, 148  
*lucens* 93, 148  
*Hookeriaceae* 148  
*Hornworts* 12  
*Hydric*, of very wet habitat, or in water.  
*Hygroamblystegium* 79, 144  
*irriguum* 79, 80, 144  
     *var. spinifolium* 80, 144  
*noterophilum* 80, 144  
*orthocladon* 79, 80, 144  
*Hygrohypnum* 82, 97, 144  
*dilatatum* 98, 103, 144  
*eugyrium* 98, 144  
*molle* 98, 144  
*novae-caesareae* 98, 105, 144  
     *var. badense* 98, 144  
*palustre* 76, 98, 144  
*Hylocomium* 64, 72, 100, 144  
*brevirostre* 72, 144  
*pyrenaicum* 72, 144  
*splendens* 64, 72, 144  
*umbratum* 72, 144  
*Hypnaceae* 141  
*Hypnum* 99, 104, 145  
*callichroum* 99, 145  
*circinale* 101, 145  
*crista-castrensis* 100, 145  
*cupressiforme* 102, 145  
*curvifolium* 101, 145  
*fertile* 102, 145  
*imponens* 102, 145  
*molluscum* 64, 100, 145  
*Patentiae* 99, 145  
*pratense* 99, 145  
*reptile* 102, 145  
*revolutum* 100, 145  
*subimponens* 99, 145  
*Vaucheri* 102, 145  
*Hypophysis*, a swelling of the seta immediately under the capsule 30 (Fig. 320h)



Fig. 320

*Icones Muscorum* 20  
 immersed, of the capsule when the perichaetial leaves project beyond it (Fig. 321)



Fig. 321

incrassate, with thickened walls  
 incubous, leaves overlapping like shingles on a roof if base of plant is at ridge and apex at the eaves 17 (Fig. 322)



Fig. 322

inflated, of alar cells which are enlarged much beyond the size of neighboring cells (Fig. 323) 16



Fig. 323

involucre, a protective covering around the calyptra or perianth formed of bracts or a short tube.  
 involute, having the margins rolled inward (upward) (Fig. 324)



Fig. 324

isodiametric, with the same diameter in every direction 16 (Fig. 325)



Fig. 325

*Jamesoniella* 120, 152  
*autumnalis* 120, 152  
*Jubula* 129, 153  
*pennsylvanica* 129, 153  
 Julaceous, cylindrical and smooth or downy (Fig. 326)



Fig. 326

*Jungermannia* 19, 120, 151  
*cordifolia* 121, 151  
*lanceolata* 121, 151  
*pumila* 120, 151  
*Jungermanniaceae* 151  
*Jungermanniales* 12, 23, 24, 69, 149

## K

Keel, a sharp ridge, as on the folds of some leaves (Fig. 327)



Fig. 327

## L

Lacinate, slashed; cut into narrow lobes (Fig. 328)



Fig. 328

Lamella, (pl. ae) thin sheets of cells usually standing perpendicular to the surface of a leaf 28 (Fig. 329a)



Fig. 329

Lamina, the flat, green part of the leaf; blade 50

## HOW TO KNOW THE MOSSES

Lanceolate, lance-shaped; 4-6 times longer than wide, broadest at base and tapering to a point (Fig. 330)

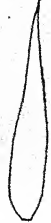


Fig. 330

- Lejeunea 132, 153  
 cavifolia 132, 153  
 Lejeuneaceae 131, 153  
 Lepidozia 118, 150  
 reptans 118, 150  
 Lepidoziaceae 150  
 Leptobryum 30, 58, 141  
 pyriforme 3, 58, 141  
 Leptodictyum 145  
 riparium 73, 79, 81, 88, 103, 145  
   *f. fluitans* 81, 145  
   *f. laxirete* 81, 145  
   *f. longifolium* 81, 145  
 siphon 81, 145  
 trichopodium 79, 145  
   var. *Kochii* 79, 145  
 Leptodon 78, 91, 148  
 nitidus 78, 148  
 ohioensis 78, 148  
 trichomitron 78, 148  
 Leskea 65, 68, 93, 103, 147  
 arenicola 69, 147  
 australis 69, 147  
 graciliscens 69, 147  
 nervosa 69, 147  
 obscura 69, 147  
 polycarpa 69, 147  
 tectorum 69, 147  
 Leskeaceae 66, 147  
 Lesquereux (pronounced Lecroo) 21  
 Leucobryaceae 136  
 Leucobryum 22, 38, 136  
 albidum 38, 136  
 glaucum 38, 136  
 Leucodon 91, 148  
 brachypus 92, 148  
 julaceus 92, 148  
 sciuroides 92, 148  
 Leucodontaceae 148  
 Leucolejeunea 131, 153  
 clypeata 132, 153  
 Lichens 7  
 Lid, see operculum 11  
 Limpricht 21  
 Lindbergia 67, 147  
 brachyptera var. *Austinii* 67, 147  
 Linear, very narrow with parallel sides.  
 Liverwort 8, 10, 18, 19, 109  
 Liverworts, leafy 11  
 thalloid 11  
 Lobe, a division (especially a rounded one) as of a leaf.

- Lophocolea 19, 122, 151  
 bidentata 122, 151  
 cuspidata 122, 151  
 heterophylla 11, 12, 18, 120, 122, 151  
 minor 122, 151  
 Lophozia 124, 126, 151  
 excisa 126, 151  
 porphyroleuca 126, 151  
 ventricosa 126, 151  
 Lumen, the cavity of a cell.  
 Lunularia 111, 154  
 cruciata 111, 154

### M

- M. F. N. A. Moss Flora of North America 20  
 Macvicar 20  
 Mamilllose, with a single large rounded papilla covering the cell  
 Mannia 112, 154  
 californica 112, 154  
 fragrans 112, 154  
 Marchantia 10, 111, 154  
 polymorpha 111, 154  
 Marchantiaceae 110, 154  
 Marchantiales 12, 23, 32, 154  
 Margined, see bordered.  
 Marsupella 126, 152  
 emarginata 126, 152  
 Marsupellaceae 152  
 Megaw, Rev. W. R. 53  
 Median leaf cell, a cell from the middle of the lamina, as distinguished from alar or apical cells.  
 Mesic, of moist habitat, neither very wet nor very dry.  
 Metzgeria 115, 154  
 conjugata 115, 154  
 furcata 115, 154  
 Metzgeriaceae 115, 154  
 Metzgeriales 11, 23, 110, 153  
 Microlepidozia 117, 150  
 setacea 117, 150  
 sylvatica 117, 150  
 Microscopes 14  
 Midrib, the middle vein of the leaf.  
 Mitrate, in the form of a peaked cap with undivided margin or with margin equally and several times cleft 16 (Fig. 308)  
 Mniaceae 141  
 Mniun 57, 141  
 affine 62, 141  
 cuspidatum 3, 62, 141  
 hornum 62, 141  
 insigne 62, 141  
 medium 62, 141  
 Menziesii 22, 61, 141  
 orthorhynchum 62, 63, 141  
 punctatum 62, 141  
 serratum 63, 141  
 spinulosum 63, 141  
 stellare 61, 62, 141  
 venustum 62, 141  
 Moerckia 116, 154  
 Plotowiana 116, 154

- Monoicous, having male and female organs on the same plant; see Autoicous.  
 Moss rose 7  
 Mueller 21  
 Musci 11, 12, 23, 24, 25, 133  
 Myurella 65, 147  
 Careyana 65, 147  
 julacea 65, 147

### N

Neck, (of the capsule) the sterile portion, if any, between seta and urn 11 (Fig. 13, 331n)

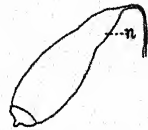


Fig. 331

- Neckera 105, 148  
 Douglasii 108, 148  
 Menziesii 71, 108, 148  
 pennata 108, 148  
 Neckeraceae 148  
 Needles 14  
 Nematodontaceae 12, 17, 23, 26, 134  
 Nodose, with rounded thickenings at intervals.  
 Notothylas 110, 155  
 orbicularis 110, 155  
 Nowellia 124, 150  
 curvifolia 124, 150

### O

Obovate, similar to ovate but broadest at the distal end. Obtuse, blunt or rounded at the end (Fig. 332)



Fig. 332

- Octoblephorum 136  
 albidum 38, 136  
 Odontoschisma 120, 150  
 denudatum 120, 150  
 prostratum 120, 150  
 Oncophorus 136  
 polycarpus 38, 48, 136  
 virens 38, 136  
 Wahlbergii 38, 136  
 Operculum, the lid or cover of the capsule (Fig. 13, 333)



Fig. 333

## HOW TO KNOW THE MOSSES

*Orthocaulis* 124, 151  
*Floerkii* 124, 151  
*Kunzeanus* 124, 151  
*quadrilobus* 124, 151  
*Orthotrichaceae* 52, 139  
*Orthotrichum* 9, 22, 53, 139  
*anomalum* 54, 139  
*cupulatum* 54, 139  
*Lyellii* 54, 139  
*obtusifolium* 53, 54, 139  
*ohioense* 55, 139  
*pumilum* 54, 55, 139  
*rupestre* 53, 139  
*speciosum* 54, 139  
*strangulatum* 54, 139  
*texanum* 53, 139  
Outline of the Keys 23  
Oval, broadly elliptical (Fig. 334)



Fig. 334

Ovate, egg-shaped with the broader end downward (Fig. 335)

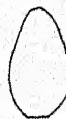


Fig. 335

P

Packets 14  
*Pallavicinia* 116, 153  
*Lyellii* 116, 153  
*Pallaviciniaceae* 116, 153  
*Papilla*, a tiny lump or knob on a cell wall 15, 33  
*Papillose*, rough with papillae 16, 22 (Fig. 336)



Fig. 336

*Paraphyllia*, threadlike or tiny leaf-like growths among the leaves 22 (Fig. 337)



Fig. 337

*Paraicous*, with antheridia in axils of perichaetial leaves just below the archegonia 17  
*Peat* 9  
*Peat mosses* 25  
*Pellia* 116, 153  
*epiphylla* 11, 12, 116, 153  
*Fabroniana* 116, 153  
*Neesiana* 116, 153  
*Pellia* 116, 153  
*Percurrent*, reaching to the apex but not beyond; percurrent costa 16 (Fig. 338)



Fig. 338

*Perianth*, a sheath surrounding the archegonia or young sporophyte 11, 19 (Fig. 339a)

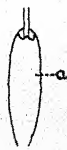


Fig. 339

*Perichaetium*, the special leaves or bracts surrounding the archegonium or base of the seta 13, 29 (Fig. 340)



Fig. 340

*Peristome*, the fringe or teeth around the mouth of the capsule 11, 15, 17 (Fig. 341)



Fig. 341

*Phascum* 22, 35, 137  
*cuspidatum* var. *americanum* 35, 137  
*Philonotis* 56, 140  
*fontana* 57, 140  
*longisetia* 57, 140

*Physcomitrium* 31, 50, 139  
*Hookeri* 51, 139  
*immersum* 51, 139  
*turbinateum* 3, 22, 51, 139  
*Pigeon wheat moss* 29  
*Pinnate*, having numerous branches on each side of an axis (Fig. 342)



Fig. 342

*Plagiochila* 121, 152  
*asplenoides* 121, 152  
*Sullivantii* 121, 152  
*Plagiochilaceae* 121, 152  
*Plagiopus* 140  
*Oederi* 57, 140  
*Plagiothecium* 105, 145  
*denticulatum* 106, 145  
*deplanatum* 107, 145  
*elegans* 107, 145  
*geophilum* 107, 145  
*micans* 107, 145  
*Roseanum* 106, 145  
*striatellum* 96, 145  
*sylvaticum* 106, 145  
*undulatum* 106, 145  
*Plane*, flat, not rolled.  
*Plant associations* 9  
*Platygyrium* 94, 103, 145  
*repens* 94, 145  
*Plectocolea* 123, 152  
*crenulata* 123, 152  
*hyalina* 123, 152  
*rubra* 123, 152  
*Pleuridium* 36, 135  
*acuminatum* 36, 135  
*subulatum* 36, 135  
*Pleurocarpi* 13, 23, 50, 63, 141  
*Pleurocarpus*, having the seta rising from a short, lateral special branch (Fig. 343)



Fig. 343

## HOW TO KNOW THE MOSSES

Plicate, folded in longitudinal pleats (Fig. 344)



Fig. 344

*Pogonatum* 27, 134  
*alpinum* 28, 134  
*brachyphyllum* 28, 134  
*contortum* 28, 134  
*pennsylvanicum* 28, 134  
*urnigerum* 28, 134  
*Pohlia* 58, 141  
*annotina* 61, 141  
*var. decipiens* 61, 141  
*carnea* 60, 141  
*cruda* 61, 141  
*delicatula* 60, 141  
*elongata* 61, 141  
*nutans* 61, 141  
*Wahlenbergii* 22, 60, 141  
*Polytrichaceae* 17, 27, 134  
*Polytrichum* 22, 27, 134  
*commune* 9, 17, 29, 134  
*juniperinum* 28, 134  
*ohiense* 29, 134  
*piliferum* 28, 134  
 Pore, the opening through the epidermis into the air chamber of a liverwort (Fig. 345)

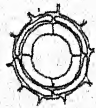


Fig. 345

*Porella* 18, 19, 128, 152  
*Cordaeana* 128, 152  
*navicularis* 128, 152  
*pinnata* 129, 152  
*platyphylla* 129, 152  
*platyphylloidea* 129, 152  
*Roellii* 128, 152  
*Porellaceae* 128, 152  
 Porose, of thick walls with thin spots (pores) (Fig. 346)



Fig. 346

*Porotrichum* 22, 75, 145  
*alleghaniense* 75, 145  
*Portulaca* 7  
*Pottia* 22  
*Pottiaceae* 137  
*Preissia* 112, 154  
*quadrata* 112, 154  
*Protonema*, the green, branched alga-like threads growing from a spore 8, 11 (Fig. 13)  
*Pseudisothecium* 22, 85, 146  
*mysuroides* 85, 146  
*stoloniferum* 85, 146  
*Pseudoleskea* 67, 147  
*atrovirens* 67, 147  
*Pseudopodium*, a leafless branch resembling a seta, bearing the capsule in *Sphagnum* and *Andreaea* 25 (Fig. 347a)



Fig. 347

*Ptilidiaceae* 149  
*Ptilidium* 117, 149  
*californicum* 117, 149  
*ciliare* 117, 149  
*pulcherrimum* 117, 149  
*Ptychomitrium* 22, 138  
*incurvum* 11, 37, 138  
*Pylaisia* 103, 146  
*polyantha* 104, 146  
*Selwynii* 103, 146  
*subdenticulata* 104, 146

### Q

*Quadrate*, square or nearly so 16

### R

*Radicles*, filaments on stems, mostly brown and running into the ground; rhizoids.  
*Radula* 18, 131, 152  
*Bolanderi* 131, 152  
*complanata* 131, 152  
*Radulaceae* 131, 152  
*Raphidostegium* 98  
*Reboulia* 113, 154  
*hemisphaerica* 113, 154  
*Reboulia* 110, 154  
 Reflexed, bent slightly backward 16 (Fig. 348)



Fig. 348

*Reindeer lichen* (moss) 7  
 Revolute, rolled backward and under, as the margins of leaves 16 (Fig. 349)



Fig. 349

*Rhacomitrium* 22, 44, 138  
*aciculare* 44, 138  
*canescens* 48, 138  
*heterostichum* 44, 138  
*lanuginosum* 44, 138  
 Rhizoids, threadlike growths, simple or branched, which serve for absorption and anchorage 8, 11 (Figs. 13, 350)



Fig. 350

*Rhizome*, a root-like horizontal underground stem (Fig. 351r)

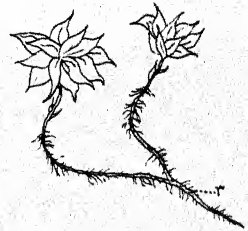


Fig. 351

*Rhodobryum* 3, 58, 141  
*roseum* 58, 141  
*Rhytidiadelphus* 64, 146  
*lozeus* 104, 105, 146  
*squarrosus* 103, 104, 146  
*triquetrus* 3, 64, 103, 146  
*Rhytidiopsis* 71, 146  
*robusta* 71, 146  
*Rhytidium* 63, 146  
*rugosum* 63, 146  
*Riccardia* 116, 154  
*multifida* 116, 154  
*palmata* 116, 154  
*pinguis* 116, 154  
*Riccardiaceae* 116, 154  
*Riccia* 114, 155  
*fluitans* 114, 155  
*Frostii* 114, 155  
*glauca* 114, 155  
*Ricciaceae* 111, 154  
*Ricciocarpus* 113, 154  
*natans* 113, 154  
 Rough, same as papillose  
 Rugose, roughened with transverse wrinkles.

## HOW TO KNOW THE MOSSES

### S

Scapania 127, 152  
 Bolanderi 127, 152  
 curta 128, 152  
 irrigua 128, 152  
 nemorosa 127, 152  
 undulata 18, 128, 152  
 Scapaniaceae 152  
 Schwetschkeopsis 65, 149  
 denticulata 65, 149  
 Scleromium 76, 146  
 Fryei 76, 146  
 Lescurii 76, 146  
 Scleropodium 86, 146  
 caespitosum 86, 146  
 colpophyllum 86, 146  
 illecebrum 86, 146  
 obtusifolium 86, 146  
 Scorpidium 96, 146  
 scorpioides 96, 146  
 Scouleria 22, 45, 138  
 aquatica 45, 138  
 marginata 45, 138  
 Seaweed 7  
 Secund, turned to one side.  
 Segments, the divisions of  
 the inner membrane of  
 the peristome when the  
 latter is double 17  
 Seligeria 37, 135  
 calcarea 37, 135  
 campylopoda 37, 135  
 Doniana 37, 135  
 pusilla 37, 135  
 Seligeriaceae 135  
 Sematophyllum 93, 94, 95,  
 98, 146  
 adnatum 95, 146  
 carolinianum 95, 146  
 marylandicum 95, 146  
 Serrate, the margin cut into  
 teeth pointing forward  
 (Fig. 352)



Fig. 352

Serrulate, very finely serrate.  
 Sessile, sitting close, without  
 a stalk.  
 Seta, the stalk of the capsule  
 or sporophyte (Fig. 13)  
 Spanish moss 7  
 Sperm, the active, coiled  
 male reproductive cell or  
 gamete 8, 19 (Fig. 10)  
 Sphaerocarpaceae 109, 155  
 Sphaerocarpaceae 12, 23, 109,  
 155  
 Sphaerocarpus 109, 155  
 texanus 109, 155  
 Sphagnaceae 12, 25, 133  
 Sphagnales 12, 23, 25, 133  
 Sphagnum 10, 22, 25, 133  
 capillaceum 26, 133  
 cuspidatum 26, 133  
 palustre 25, 133

Spindle-shaped, tapering to  
 each end 15, 16 (Fig.  
 353)

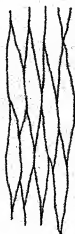


Fig. 353

Splachnaceae 12, 26, 139  
 Splachnum 29, 139  
 ampullaceum 29, 139  
 luteum 29, 139  
 Sporangium, the capsule  
 Spore, a microscopic repro-  
 ductive body, in mosses  
 1-celled and borne in the  
 capsule 17  
 Sporophyte, the spore-bear-  
 ing part or generation,  
 composed of foot, seta  
 and capsule 11, 17 (Fig.  
 13)  
 Squarrose, of leaves with  
 midrib bent back at right  
 angles to the stem 40  
 (Fig. 354)



Fig. 354

Sterile, without sporophyte  
 or spores.  
 Stoma (pl. stomata), an  
 opening through the epi-  
 dermis bordered by two  
 special cells 9 (Fig. 355)



Fig. 355

Struma, a swelling on one  
 side of the base of a  
 capsule (Fig. 356s)



Fig. 356

Strumose, having a struma  
 16, 38  
 Substratum, the material on  
 which the plant grows.  
 Succubous, with leaves over-  
 lapping like shingles on a  
 roof if base of plant is  
 at eaves and apex at the  
 ridge 18 (Fig. 19)  
 Sullivant 20, 21  
 Sullivant Moss Society 4, 21  
 Swamp, low ground saturat-  
 ed with water, but usual-  
 ly not covered with it,  
 producing more or less  
 shrubs and trees.  
 Synoicous, with antheridia  
 and archegonia mingled  
 17  
 Syrrhopodon 47, 146  
 floridanus 47, 146  
 texanus 47, 146  
 Systematic List 13, 133

### T

Tayloria 30, 139  
 serrata 30, 139  
 Terete, round in cross sec-  
 tion.  
 Tessellate(d), marked in  
 checkered squares (Fig.  
 357)



Fig. 357

Tetraphidaceae 26, 134  
 Tetraphis 26, 134  
 geniculata 26, 134  
 pellucida 26, 134  
 Tetraplodon 30, 139  
 mnioides 30, 139  
 Thallus, a plant body not  
 differentiated into stem  
 and leaf 11 (Fig. 358)

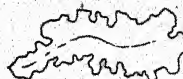


Fig. 358

Thelia 66, 147  
 asprella 66, 147  
 hirtella 66, 147  
 Lescurii 66, 147  
 Thuidium 67, 70, 148  
 abietinum 70, 148  
 delicatulum 71, 148  
 microphyllum 70, 148  
 minutulum 70, 148  
 pygmaeum 70, 148  
 recognitum 71, 148  
 scitum 70, 148  
 virginianum 70, 148

## HOW TO KNOW THE MOSSES

*Timmia* 52, 140  
*austriaca* 52, 140  
*megapolitana* 52, 140  
*Timmiaceae* 140

Tooth (teeth), the processes composing the peristome, or the outer row of such processes when the peristome is double (Fig. 359)

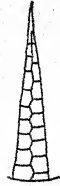


Fig. 359

*Tortella* 48, 137  
*humilis* 49, 137  
*fragilis* 49, 137  
*tortuosa* 49, 137  
*Tortula* 22, 48, 138  
*Bolanderi* 49, 138  
*mucronifolia* 42, 138  
*muralis* 49, 138  
*princeps* 49, 138  
*ruralis* 49, 138

Trachea, a thick walled water tube made of many cells in a row 12

Tracheata 12  
 Tracheids, single celled water tubes with thickened walls 12

*Trematodon* 43, 135  
*ambiguus* 41, 43, 135  
*longicollis* 43, 135  
*Trichocolea* 117, 150  
*tomentella* 117, 150

Trigone, a thickening of cell walls where three or four cells come together 19 (Fig. 360)



Fig. 360

*Tritomaria* 123, 151  
*exsecta* 123, 151  
*exsectiformis* 123, 151  
*quinquedentata* 123, 151  
 Truncate, ending abruptly as if cut off (Fig. 361)



Fig. 361

### U

*Ulota* 22, 53, 140  
*americana* 53, 140  
*crispa* 53, 140  
*Ludwigii* 53, 140

Underleaf, a small leaf on the under side of the stem in liverworts 18, 19 (Fig. 362a)



Fig. 362

Underlobe, in a folded complicate-bilobed leaf the part lying nearest to the substratum (Fig. 363a)



Fig. 363

Undulate, with wavy margin or surface 39  
 Urn, the spore-bearing part of the capsule 11 (Fig. 13)

Using the Keys 22  
*Usnea* 7

### W

*Weisia* 22, 46, 138  
*viridula* 46, 138

### X

Xeric, of a dry habitat.

### Z

Zygote, the germ cell resulting from the fusion of egg and sperm.

